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A
SYSTEM OF SURGERY;

PATHOLOGICAL, DIAGNOSTIC, THERAPEUTIC, AND OPERATIVE.

M131

BY

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PART SECOND.

SPECIAL SURGERY;

OR,

DISEASES AND INJURIES

OF

PARTICULAR ORGANS, TEXTURES, AND REGIONS.

A

SYSTEM OF SURGERY.

SPECIAL SURGERY; OR, DISEASES AND INJURIES OF PARTICULAR ORGANS, TEXTURES AND REGIONS.

CHAPTER I.

DISEASES AND INJURIES OF THE JOINTS.

SECT. I.—DISLOCATIONS.

1. GENERAL CONSIDERATIONS.

A DISLOCATION, or luxation, is the sudden and forcible removal of one articular surface from another, generally as a result of external violence.

As all joints are necessarily composed of at least two bones, the question naturally arises, which should be considered as the luxated one? Upon this subject all surgical authorities are, so far as I am acquainted with their writings, agreed. In every accident of this description the bone nearest the trunk is regarded as the fixed bone, and the one articulated with it as the dislocated. Thus, in luxation of the shoulder-joint, the scapula retains its normal position, either actually or supposititiously, while the humerus is thrown off the glenoid cavity, at one time in this direction, and at another in that. In dislocation of the elbow, the ulna and radius are forced away from the humerus, the latter serving as the fixed point. The same rule obtains in regard to all the articulations of the inferior extremity, except that of the ankle, in which, by a singular perversion of the manner of considering the subject, the foot is looked upon as the fixed point, and the tibia as the movable.

Dislocations are divisible into simple and complicated, complete and incomplete, primitive and consecutive, recent and old, single and double. When the accident occurs before birth it is designated by the term congenital.

A luxation is said to be *simple* when it is unaccompanied by anything more than a slight rupture of the ligaments, or of the ligaments and muscles. Although such an accident is usually produced by external force, as a blow or fall, it may occasionally arise purely from muscular action, especially when it is favored by disease of the affected joint.

In a *complicated* dislocation there is, in addition to the loss of relation between the two contiguous surfaces, some serious lesion of the soft parts, as, for example, a wound communicating with the displaced bone or opening directly into the articulation, laceration of important vessels or nerves, contusion of the integuments and muscles, or fracture of the luxated bone. When the wound penetrates the affected joint, the accident is usually called a compound dislocation.

A *complete* luxation is one in which the head of a bone, totally removed from its corresponding articular surface, effects a lodgment in a new situation; as, for instance, when the head of the humerus is forced down into the axilla, resting against the border of the scapula, below the glenoid cavity. In an incomplete luxation, on the contrary, the articular surfaces, although they have lost their relative position, remain still partially in contact with each other. Displacement of the head of the humerus against the coracoid process affords a good illustration of this variety of accident.

In *primitive* dislocation, the displaced bone continues in the position into which it was originally forced; in consecutive, it abandons its original situation, and becomes fixed in another. Such an accident, however, can only happen, as a general rule, when the luxation depends upon some organic disease of the articular surfaces, allowing them gradually to separate from each other, either by the mere weight of the corresponding limb, or by the action of the neighboring and associated muscles. In the traumatic form of the injury such an event must be exceedingly rare, although we must admit its possibility, the dislocating agent forcing the bone at once to the greatest verge of its displacement; or, as not unfrequently occurs, its farther progress is effectually arrested by some opposing osseous prominence or some tensely strung soft part, as a tendon, muscle, or fibrous membrane. Luxation of the knee-joint from caries of the articular surfaces furnishes a characteristic exemplification of these two kinds of displacement. In this accident the head of the tibia gradually forsakes the condyles of the femur, slipping back into the popliteal region, from whence, in time, it is drawn up against the posterior surface of the bone by the flexor muscles, thus suffering secondary luxation. A similar occurrence, although exceedingly uncommon, may, nevertheless, happen in a very robust subject in traumatic dislocation of the hip, shoulder, or lower jaw, where the force is barely sufficient to lift the head of the bone out of its socket upon, but not over, its rim, from which it is afterwards removed either by mere muscular contraction or by the conjoint influence of this and the weight of the part connected with the displaced bone.

The terms *recent* and *old* refer merely to the duration of the injury, and might seem, at first view, to require no particular explanation. The propriety of this, however, will be rendered at once obvious if the question be asked, when does a dislocation become old? does it become old in a few days, or weeks, or months? As far as mere time is concerned, no lesion of this kind can be regarded as old unless it has existed for at least from six to twelve months; but if we look at the subject in a practical point of view, or, what is the same thing, in reference to our ability to restore the affected joint to its natural relations, it will be found that, while one dislocation may not be old at the end of several months, another may become so within the first few weeks. Thus, a luxated shoulder may frequently be successfully reduced after a lapse of two months, or even considerably later, whereas if we attempt to restore a dislocated elbow at the end of one-third or even one-fourth of that time, we shall generally signally fail. The import of these two terms, then, is one of much greater importance than has generally been admitted, having, practically considered, a positive value and significance.

A *single* dislocation is one in which only one joint is involved; in the double form of the accident, on the contrary, the corresponding joint is likewise affected. The lower jaw suffers more frequently in the latter way than any other piece of the skeleton, but a similar displacement is also occasionally witnessed in the humerus, ulna, radius, clavicle, ilium, and fibula. Double dislocation may be complete or incomplete, simple or complicated.

In relation to its *seat*, it may be observed that nearly all the joints in the body are liable to dislocation; nevertheless, experience has shown, what a knowledge of the structure and functions of these parts might have led us to anticipate, that those which admit of varied and extensive motion are much more prone to this injury than such as enjoy only a very limited motion. Hence, what are called the ball and socket joints, of which those of the hip and shoulder are the best representatives, are a great deal oftener affected than the ginglymoid, as those of the elbow and knee. The tables of Malgaigne prove that dislocations of the shoulder-joint are more frequent than those of all the other movable articulations together, 321 cases out of 481 having occurred here. Comparing the relative proportion of cases in the two extremities, the same distinguished observer finds that they are seven times more numerous in the superior than in the inferior.

These differences in the relative frequency of this lesion in different joints are, as already stated, clearly referable to the differences in their structure and functions. Of all the large articulations in the body, that of the shoulder is the most insecurely constructed; the glenoid cavity is remarkably shallow; the capsular ligament is long and loose, and the joint, admitting of every variety of motion, is under the direct influence of numerous powerful muscles, and exposed to numerous accidents. Why, then, should we be surprised that it is so often the seat of dislocation? The hip-joint, on the contrary, is the most admirably contrived joint of which we can possibly form any conception; as a piece of mechanism it is perfect; the acetabulum is an immense socket, in which the whole head of the femur is literally buried, and to which it is still further secured by two powerful ligaments, the round and the capsular; and, in addition to all this, it is surrounded by numerous large muscles, which serve to support and protect it from injury. Thus constituted, this articulation is comparatively seldom the seat of dislocation, hardly, as compared with that of the shoulder-joint, in the proportion of 1 to 9½. The clavicle, which enjoys only a very limited degree of motion, is not infrequently luxated, its exposed situation and its buttress-like office rendering it peculiarly prone to the accident, occupying, in this respect, nearly the same rank, according to Malgaigne's statistics, as the hip-joint.

Thus, recapitulating what has been said above, we may conclude that the most powerful predisposing causes of dislocation are, varied and extensive motion of the joints, want of firmness between the articulating surfaces, arising either from their shallowness or the structure and arrangement of their ligaments, and the exposed situation and peculiar functions of the bones entering into their composition.

The *direction* in which dislocations occur is subject to much diversity, depending upon the nature of the joint, and the direction in which the force is applied at the time of the accident. In the ginglymoid articulations the bones may be displaced backwards, forwards, or to either side; in the orbicular, as, for example, that of the shoulder, downwards, forwards, upwards, or backwards.

Dislocations may occur at any *period of life*, but are most frequent in middle-aged and elderly persons. Of 643 cases, analyzed by Malgaigne, only one occurred under the fifth year, and none after the ninetieth. The period of the greatest frequency was between the thirtieth and sixty-fifth year. The reason of these differences is to be found in the circumstance that the bones of young subjects, being comparatively soft and pliant, and not yet everywhere completely solidified, yield most easily at their epiphyses and even at their shafts, while those of very old and decrepit people are generally so brittle that it requires much less force to break than to luxate them. It is seldom that we have an opportunity of seeing a dislocation of the hip-joint after the age of sixty, while it is sufficiently common to meet with fracture of the neck of the femur within the capsular ligament. This statement, however, must be received with some degree of restriction, for it is obviously not applicable to all the articulations. The shoulder-joint, for instance, forms a striking exception, its dislocation in old age being much more frequent than fracture of the superior extremity of the humerus.

Causes.—The efficient causes of dislocation are external injury and muscular contraction. Most cases are due to the former, acting either directly upon the joint, or indirectly through some bone articulated with it. Dislocation of the shoulder, consequent upon a blow or fall upon its top, affords a good illustration of the manner in which injury acts when applied directly to an articulation. In this case the force is spent upon the superior extremity of the humerus, propelling the head of the bone down into the axilla, beyond the glenoid cavity of the scapula. The femur may be luxated in a similar manner, by a heavy body falling on the hip, while the thigh is in a state of abduction. Lateral dislocation of the patella is another instance of displacement occasioned by direct violence. Sometimes a severe wrench is necessary to produce the accident, especially when the bones are connected by short and strong ligaments, requiring great force to separate them.

A more common mode of causing this accident is by the indirect application of force. Indeed, nearly all the dislocations of the upper extremity, and man also of the lower, are the result of violence, transmitted from the distal portio of the limb, and concentrated upon some particular bone, which thus loses it connection with the opposing surface. It is in this manner that falls upon th hand so often luxate the wrist, the elbow, and even the shoulder, according t the point upon which the violence is exploded. Dislocation of the clavicle i usually induced by falls upon the shoulder, in which this bone is acted upon b two forces coming in opposite directions, the one being caused by the weight o the body, and the other by the object struck.

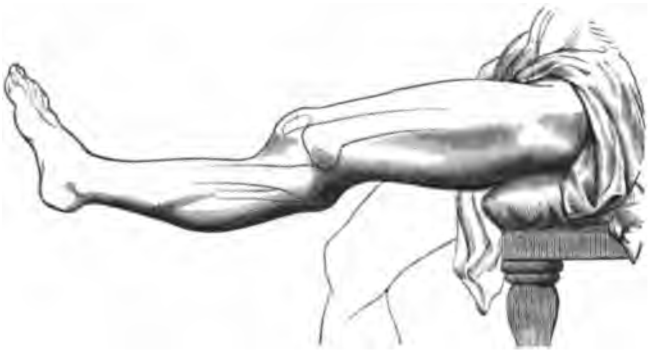
Of the ability of the muscles to induce this accident, experience has furnishe ample proof. I have myself witnessed a number of examples of it, mostly in th shoulder, during attacks of epilepsy. In one, the accident occurred simply b raising the hand above the level of the head. Yawning is a common cause o dislocation of the lower jaw. Several cases have been recorded of displacemen of the thigh-bone by muscular contraction. In the ginglymoid joints such occurrences must, for obvious reasons, be much less frequent than in the orbicular.

Some persons possess the power of dislocating certain joints voluntarily, simply by muscular action. I have seen several individuals who possessed this faculty, but I have always noticed that, however strongly they exerted themselves, they could not produce anything like a complete displacement of the articular surfaces, and it is presumable that most of the examples that have been reported have been of this description. Dr. Haynes, of Saratoga, has published the particulars of the case of a lad, seven years old, who is said to be able to luxate, and also to reduce, the joints of the knee, elbow, wrist, thumb and fingers, with perfect ease, by muscular contraction.

In all cases of dislocation, whether the result of direct or indirect injury or of muscular contraction, the accident is materially favored by a partial separation of the articular surfaces. The lower jaw cannot suffer displacement so long as it is closed, but if the chin is struck while the body is depressed, and the condyle drawn forward upon the anterior convex part of the temporal fossa, the slightest blow will suffice to throw the bone down over the root of the zygomatic process. Dislocation of the humerus into the axilla is greatly promoted by abduction and elevation of the arm. The femur is generally luxated upwards and backwards against the dorsal surface of the ilium, by falls upon the hip, and the occurrence is always greatly facilitated by the circumstance of the person having a heavy load on the back. A twisted or contorted state of the limb is generally highly conducive to the accident.

Organic disease of a joint may become a cause of dislocation, as seen in fig. 1, from a patient of Professor T. G. Richardson. The man had labored for a long time under an arthritic affection of the knee, which was gradually followed by permanent displacement of the head of the tibia backwards behind the con-

Fig. 1.



Dislocation of the knee from disease.

dyles of the femur. There was no external disease of any kind. The head of the bone could easily be reduced, but not kept in position, owing, apparently, to the complete destruction of the ligaments of the joint.

2. SIMPLE DISLOCATIONS.

Dislocations are characterized by a certain train of *symptoms*, by which they may, in general, be easily distinguished from other accidents. Of these symptoms, the most constant and prominent are, loss of function of the affected articulation, lodgment of the displaced bone in an unnatural situation, deformity of the joint, and change in the mobility, length, and axis of the corresponding limb. To these may be added, as subordinate phenomena, the noise which is occasionally heard by the patient at the moment of the accident, numbness of the parts from pressure of the luxated bone upon the nerves, contusion and discoloration of the integuments, together with pain, swelling, and crepitation as effects of the resulting inflammation.

Immediate and, generally, entire *loss of function* of the affected joint is a necessary consequence of dislocation, however induced. Thus, in luxation of the temporo-maxillary articulation, the lower jaw is widely separated from the upper, and all the efforts that the patient can make are insufficient to shut his mouth. When the principal joints of the upper extremity are affected, the person is unable, without assistance, to carry his hand to the head, or to execute the motions of flexion, extension, circumduction, pronation, and supination; the whole limb feels heavy and numb, and requires to be supported by the sound one. In dislocation of the foot, leg, and thigh, progression is not only impracticable, but every attempt of this kind is attended with so much distress as to cause at once its discontinuance. The loss of function necessarily persists so long as the joint remains unreduced, although, in time, it is often partially regained.

Impairment of the *motion* of the corresponding limb is an important symptom of this lesion. The patient, in general, not only loses all voluntary control over the member, but the surgeon, upon taking hold of it, and attempting to carry it about in different directions, finds it impossible to effect his object. Motion, it is true, is not always completely abolished, but there is no case in which it is not considerably, if not greatly, restricted. In some of the articulations, as, for example, in that of the elbow, the displaced bones are so thoroughly interlocked, or hooked together, as to render it difficult, even by the most adroit and persevering efforts at extension and counter-extension, to disengage them from each other, and restore them to their natural situation. Immobility, therefore, is one of the most valuable symptoms of dislocation. Its causes are threefold, muscular contraction, opposing osseous prominences, and constricting ligamentous bands, or all these united. A knowledge of these obstacles is of great practical moment, as it involves important therapeutic considerations, which should be well understood by every surgeon.

In most cases of this accident the surgeon is able to feel the displaced bone in its new *situation*, beyond the limits of the corresponding articular surface. Sometimes, indeed, it may even be readily detected with the eye, from the prominence which it forms by raising up the muscles and integuments beneath which it lies. In order to ascertain the precise position of the bone, a careful examination will generally be required, especially when there is much tumefaction obscuring the symptoms. For this purpose one hand is placed upon the injured joint, while the other is employed in moving the corresponding limb; when greater accuracy is necessary, this office is confided to an assistant, in order that both hands may be used for conducting the investigation. If the manipulation is productive of severe pain, it should be desisted from until the system has been brought fully under the influence of anæsthesia. The distance to which the head of the displaced bone is thrown varies, in different cases, from a few lines to several inches, depending upon the size and shape of the joint, and the amount of force employed in producing the accident; as a general rule, it is greater in the orbicular than in the ginglymoid articulations.

Deformity of the joint is another symptom of dislocation, and generally one of the most reliable. This usually manifests itself in a marked flattening of the articulation, as in dislocation of the humerus into the axilla, where there is always a loss of rotundity of the cushion of the shoulder from the manner in which the deltoid muscle is spread out; or in great increase of the width of the joint, as in lateral luxation of the elbow and knee. Sometimes the joint has a singularly contorted, angular, or twisted appearance.

A change in the *length* and axis of the limb articulated with the displaced bone is generally a prominent symptom. It is seldom that the limb retains entirely its normal length; most commonly this is either increased or diminished, the extent varying according to the structure of the joint and the degree of force employed to produce the accident. Shortening is much more frequent than elongation. Thus in the various forms of luxation of the shoulder and hip there is only one in each in which the limb is increased in length, while in all the rest it is considerably, if not greatly, shortened, amounting in some of them to several inches. No material difference exists in regard to this symptom in the dislocations of the orbicular and ginglymoid articulations.

Dislocation not only changes the length of the affected limb, but also, in most cases, its *axis*, giving it a peculiarly contorted or twisted appearance. This appearance is nowhere more conspicuous than in the displacements of the elbow-joint, in some of which it is almost diagnostic. Another excellent illustration of this occurrence is afforded in luxation of the head of the humerus into the axilla, where this trait is often so well marked as at once to convince the practised eye of the nature of the accident. In most of the displacements of the orbicular joints the limb stands off at a considerable distance from the body, in a constrained and twisted state.

Of the subordinate symptoms there is not one which is of any real value; nevertheless, they are deserving of some consideration, if for no other reason than that of completing the history of this accident.

It is highly probable that most dislocations, at least those of the larger joints, are attended with some degree of *noise* at the moment of their occurrence; but that this noise is not often heard by the patient may be assumed from the fact that he is so seldom conscious of it when interrogated respecting it. The reason of this no doubt is that the confused state of his mind consequent upon the sudden and unexpected nature of the accident prevents him from perceiving it. Its character cannot be easily described, but it may perhaps be said to bear a closer resemblance to a cracking noise than anything else to which it can be compared. It appears to be caused by the sudden and forcible separation of the articular surfaces, aided, probably, by the laceration of the connecting ligaments, and is generally most distinct in luxations of the orbicular joints.

A considerable degree of *numbness* is occasionally felt in the parts immediately around the affected joint, and even in the whole of the corresponding limb. It evidently depends upon the compression of the nerves by the displaced bone, and is particularly distressing in the axillary form of dislocation of the shoulder, in which the tingling sensation often extends to the very tips of the fingers.

More or less *contusion* and discoloration are often present. The contusion may be accompanied by scratches of the skin, or even considerable wounds, which thus complicate the case. The discoloration varies from the slightest change of the normal hue to deep purple, depending upon the size and number of the vessels whose laceration is the occasion of it. Large quantities of blood are sometimes effused among the tissues in the immediate vicinity of the affected joint and even into the joint itself.

The *pain* consequent upon dislocations varies greatly in different individuals, often depending, perhaps, quite as much upon their idiosyncrasy as upon the severity of the injury. Its immediate cause, of course, is the rupture of the ligaments and other structures in and around the affected joint, and may, on the one hand, be so excessive as to induce fainting and other distressing effects, or, on the other, so insignificant as hardly to attract attention. It is always increased by manipulation and motion, as well as upon the supervention of the inflammatory process, and frequently continues for days and weeks, depriving the patient of appetite and sleep. In nervous, irritable subjects it occasionally assumes a neuralgic character. When the displaced bone compresses an important nerve, it is generally attended with a feeling of numbness and tingling.

More or less *swelling* always succeeds to dislocations; sometimes almost instantly, but generally not under several hours; at one time slight, at another exceedingly severe. When it appears suddenly, within a few minutes after the accident, it is always due to effusion of blood, and is then either attended or soon followed by discoloration of the integuments. Coming on more slowly, there will be reason to conclude that it is the result purely of inflammatory deposits, especially serum and lymph, or of these deposits and of blood combined. When the incited action runs very high, the swelling will generally be proportionately great, the part being hard, stiff, glossy, painful, and intolerant of manipulation.

The *friction-sound* which occasionally attends recent unreduced dislocations has been ascribed to different causes. By some, as J. L. Petit, it has been supposed to depend upon a dryness of the articular cartilages; others consider that it is due to the presence of a superabundance of synovial fluid; Sir Astley Cooper was of opinion that it proceeded from a deposit of fibrin within the joint and the neighboring burses; while Malgaigne thinks that it is occasioned by the rubbing of the head of the luxated bone against an osseous surface denuded of its periosteum. I have alluded to these various theories rather because they represent the views of distinguished authors, than on account of any intrinsic value which they may possess. The question of the real cause of this sound is still an open one, and more careful observation and dissection than have yet been made will be required before it can be finally settled. Meanwhile, I am strongly inclined to the belief of the English surgeon that it is mainly, if not wholly, due to plastic effusion into and around the articulation, and this idea is strengthened by the fact that it cannot be elicited until after the occurrence of inflammation. If it were occasioned by dryness of the articular cartilages, or denudation of the bone, it ought, as a natural consequence, to be perceptible immediately after the infliction of the injury, which, however, it never is.

The term friction perhaps expresses the nature of this sound better than any other that can be employed; it is entirely different from the grating noise and sensation caused by rubbing together the two ends of a broken bone; it is more like the sound occasioned by rubbing over each other two pieces of sole-leather; it is a soft, creaking, or crackling noise, not a grating one.

Diagnosis.—The accident with which dislocation is most liable to be confounded is undoubtedly fracture, especially fracture in the vicinity of the articulations, an occurrence not only quite frequent, but generally exceedingly embarrassing, on account of the difficulty of its diagnosis. The most constant and reliable symptoms of dislocation, as already stated, are, deformity, both of the affected joint and limb, loss of function, impaired motion, and difficulty of restoring the displaced bone to its natural situation. In fracture the most important characters are, distortion, preternatural mobility, and crepitation, with facility of reduction.

If we compare these symptoms with each other, it will be found that, although there is some resemblance between some of them, yet that, in the main, they are strikingly dissimilar, and, therefore, in so far, diagnostic of the accidents which they respectively serve to characterize. Deformity is common to both dislocation and fracture, and is, therefore, of little, if any, value as a point of distinction between them. The same is true of the loss of function, which is often, perhaps generally, quite as great in the one as in the other. If a man with a luxated hip may occasionally support the weight of his body upon the affected limb, or even walk slightly upon it, he can sometimes do as much, and even more, when he has an impacted fracture of the femur, or a fracture of the neck of that bone temporarily unattended with a separation of the fragments. A dislocated jaw is quite as helpless as a broken one; in neither case can it perform the office of mastication.

Both these symptoms, then, are without the slightest value in a diagnostic sens But it is very different with the others above enumerated. Mobility, for exampl is a differential sign of great value. In dislocation, mobility is either entirely los or, at all events, very much impaired; the displaced bone is more or less firml fixed in its new situation, and can only be restored to its natural position b powerful efforts, often long and anxiously continued. In fracture, on the con trary, there is always an increase of motion, or, more properly speaking, there i preternatural mobility, the limb allowing itself to be bent, extended, and eve rotated upon its axis. Moreover, by extension and counter-extension the membe may readily be restored to its natural length and shape, but the moment thes efforts are discontinued there is a reproduction of all the previous symptoms. Such an event never happens in dislocation; when the bone is once reduced i remains reduced, unless accident should again lift it out of its socket. Lastly, in luxation the replacement is usually attended with a peculiar noise or snap, caused by the forcible contact of the opposing surfaces; in fracture such a noise is never distinguishable. Crepitation is another valuable diagnostic in these accidents. In dislocation the only sound ever perceived is a kind of friction-sound, and this is never present until after the supervention of inflammation; in fracture, on the contrary, crepitation is one of the most important symptoms; indeed, it is the characteristic sign of the lesion. It may be detected immediately after the accident, and during all stages of the after-treatment up to the time of incipient union. Deformity and preternatural mobility may both be absent, and yet if there be crepitation, or a rough grating noise and feel upon rubbing together the ends of the broken bone, there can be no doubt respecting the real nature of the case. It is a fracture, and nothing else. So, on the other hand, if there be deformity and loss of motion, with absence of crepitation, the rational inference is that the case is one of luxation, or, at all events, not one of fracture.

Another valuable sign in this accident, but one which has only a general application, is the difference in the position of the affected limbs in the two classes of injuries. In dislocation the limbs often stand off at a considerable distance from the body, in a constrained and unseemly attitude; in fracture, on the contrary, they always hang close by the side of the body. Most of the displacements of the hip and shoulder joints exhibit this peculiarity, and I consider it as of no little value as a means of discriminating between these lesions and fractures of the superior extremities of the femur and humerus.

Contusion, discoloration, pain, and swelling being common to both dislocation and fracture, are worthless in a diagnostic point of view. Instead of being of advantage in this respect, they only, in general, serve to embarrass the attempts at discrimination. Numbness, however, possesses a certain value, especially in some of the luxations of the shoulder and hip, where it occasionally constitutes a prominent and distressing symptom, which is never the case in fracture, except under very rare circumstances, when the ends of the broken bone pierce, bruise or compress a large nerve.

Important aid may sometimes be derived, in our investigations, from a knowledge of the position which the dislocated bone is most liable to occupy. Thus in displacement of the shoulder, the head of the humerus is usually thrown into the axilla, or forwards against the chest, seldom upwards or backwards; the most common luxations of the femur are those upon the dorsal surface of the ilium and into the sciatic notch. In the ginglymoid joints, especially those of the knee and elbow, posterior displacement is most common.

After all, however, no matter what may be the character or prominence of the symptoms, a correct and reliable diagnosis can only be arrived at, in any case, by a thorough examination of the condition of the parts concerned. Without the light which such an investigation is capable of furnishing, no surgeon, however skilful or experienced, can always be certain whether the accident is one really of dislocation or of fracture, or whether these lesions do not coexist. In conducting the examination, the same general rules are applicable as in fracture. The sooner, of course, it is made the less likely will it be to occasion severe suffering to the patient, or annoying embarrassment to the practitioner. When the parts have become tumid and infiltrated, the nature of the accident is usually very much obscured, and the manipulation only aggravates the already existing mischief. Besides, they will then be so painful as to render it impossible to touch them without putting the patient under the influence of an anæsthetic. It is unnecessary to say that when a joint is in this condition, it must be handled with the greatest care and gentleness; yet at the same time the exploration should be thorough, otherwise it cannot be satisfactory, and, if one trial is not sufficient, another should be made soon after the first, means being used, meanwhile, to allay pain and inflammation, in order to render the parts more tolerant of manipulation.

A careful measurement of the affected limb, or, rather, of the portion of the limb between the affected joint and the one next below, will often throw considerable light upon the diagnosis. Thus, if, in injury of the shoulder-joint, the distance between the acromion process and the elbow be found to be considerably greater than on the sound side, it would be a legitimate inference that the case was one of dislocation into the axilla, and not of fracture of the head or neck of the humerus. In luxation of the elbow backwards, the forearm is always sensibly shortened, only, however, in front, for behind it must necessarily retain its normal length. The measurement must be taken with a piece of tape, which, in order to insure greater accuracy, should, if possible, be graduated, the ends being applied against two fixed points, and the same operation being performed upon the sound limb.

When, notwithstanding all these examinations and precautions, the case remains one of doubt, the surgeon should not hesitate to adopt the suggestion of Malgaigne, of inserting a long and slender needle into the joint, and also, if necessary, into the parts immediately around, with a view of ascertaining their precise condition. Should a hollow be found where there is naturally a projection, or a projection where there ought merely to be a cavity, the presumption will be strong that the case is one of dislocation, and the conjecture will be converted into positive certainty if there is an absence of crepitation and preternatural mobility. There can be no possible objection to such an exploration, if it is conducted with proper care in regard to the avoidance of the larger vessels and nerves, and if the instrument is sufficiently slender to make only a small puncture, and so well tempered as not to break. It is surprising, when we consider the facility and safety of this operation, and the undoubted light which it is capable of affording in obscure cases of this accident, that it should not have attracted more attention, or been more frequently employed.

Finally, dislocations are sometimes painfully simulated by sprains, so much so, indeed, as to puzzle and perplex the most sagacious observer. In such an event, nothing short of the most patient and accurate examinations and measurements, repeated again and again, both in the recumbent and in the erect position, will be likely to prevent mistake.

Morbid Anatomy.—On dissecting a joint that has been recently luxated, the head of the bone will be found to be more or less removed from its socket, the distance to which it has been thrown ranging from a few lines to several inches, according to the structure of the parts involved, and the degree of force concerned in producing the accident. In the incomplete form of the lesion the articular surfaces still partially retain their apposition, while in the complete all connection is lost. The displaced head rests either upon some muscle, tendon, or bone, or upon all these structures, and the socket is generally occupied with blood, either fluid, or partly fluid and partly coagulated. The ligaments are lacerated, elongated, and relaxed, the extent of the rent varying from a mere fissure, barely large enough to admit the escape of the bone, to almost complete reparation from their osseous attachments. The capsular ligaments are usually more extensively torn than the band-like, and, in both cases, shreds of the injured structure are occasionally interposed between the bone and the parts upon which it rests. In dislocations from muscular contraction, as in those of the jaw and shoulder, slight laceration of the ligaments is generally conjoined with marked elongation, and dissection has rendered it probable that cases of this kind occasionally occur even without any rupture whatever. The muscles in the immediate vicinity of the injured articulation usually participate, at least to some extent, in the mischief sustained by the ligaments, being, like them, more or less stretched, contused, or even lacerated, though the latter occurrence is commonly neither frequent nor extensive. The nervous trunks around the joint may be compressed and displaced by the luxated bone, but are rarely, if ever, torn, or seriously hurt in any way. The same is true of the larger vessels, both arterial and venous, the hemorrhage which follows the accident, and which is usually quite insignificant, proceeding from the smaller ligamentous, cellular, and muscular branches. If the patient has survived the accident several days, so that the parts have had time to become inflamed, more or less plastic matter will be found, both in the socket and in the neighboring tissues, matting and gluing them together.

Prognosis.—The prognosis of simple dislocations must be considered with reference to two circumstances, the restoration of the displaced bone, and the severity of the injury sustained by the accident. If attended to early, they may commonly be easily reduced, and are seldom dangerous either to life or limb. If, however, they are neglected, or improperly managed, more or less deformity and loss of motion must ensue, and the resulting inflammation may be so great as to cause serious constitutional disorder. Luxations of the orbicular joints are generally less hazardous than those of the ginglymoid, but they are nearly always more difficult of reduction, on account of the adjacent muscles being more numerous and powerful, and, consequently, more resisting. On the other hand, however, the displacements of the orbicular articulations retain their reducibility much longer than the ginglymoid; thus, a luxated shoulder may often be restored at the end of several months, whereas a luxated elbow generally becomes irreducible within as many weeks. In children, old persons, and females, the restoration is generally more easily accomplished than in adults, or in strong, robust individuals, whose muscles are more developed, and, therefore, less easily subdued. This difference obtains, in the same relative degree, even when anæsthetics are used.

Treatment.—The leading indications in the treatment of simple luxations are, first, to return the articular surfaces as soon as possible to their natural situation; secondly, to keep the affected joint at rest until the lacerated ligaments and other structures have become repaired; thirdly, to limit and subdue inflammation; and, fourthly, to restore the functions of the parts. The character of these indications, and the mode of fulfilling them, should be kept clearly and prominently before the eye of the practitioner; for, unless he has accurate and definite conceptions upon the subject, he must often fail in accomplishing his object in a satisfactory and creditable manner.

In entering upon the consideration of the treatment of this class of accidents, the first question that arises is, what are the causes which oppose the reduction of dislocations, or, in other words, why is it that dislocations do not disappear of their own accord? Until recently it was generally supposed that the principal barrier to the reduction was the resistance offered by the muscles connected with the displaced bone, contracting at first spasmodically, and then permanently, so as to hold the part firmly in its new position. To overcome this action of the muscles in the vicinity of the affected joint has, therefore, always been a leading indication in the attempts at reduction; and yet how signally these attempts frequently fail, after the most thorough relaxation, not only of these muscles, but of the whole system, by the lancet, tartar emetic, and the warm bath, is well known. This fact of itself, then, is sufficient to prove that, although muscular contraction is one of the main agents which oppose the reduction, it is not by any means the only, nor always even the principal, one. If the difficulty depended merely upon the resistance of the muscles, whether spasmodically acting or temporarily shortened, the use of depressants and anæsthetics, aided by steady, persevering extension and counter-extension, ought to enable the surgeon to reduce, promptly and effectually, every dislocation whatever. But this is not the case; the patient, in former days, used to be bled to syncope, nauseated to the utmost with tartar emetic, and literally parboiled, and yet, half dead as he was, restoration was frequently impossible, and so it is still in these days of chloroform and ether. This, then, being the fact, we must seek for other opponents, capable at least of aiding the muscles in their resistance, or of themselves sufficient to offer a serious, if not insuperable, barrier to the reduction. Such obstacles are found in the bones and ligaments, and but for these it would be difficult to conceive of any case of dislocation that could resist, more than a few minutes, any well-directed efforts at restoration. In truth, almost every dislocation would reduce itself. Why is it that the surgeon frequently experiences so much trouble in replacing a luxated thumb? Is it not because of the resistance offered by the prominences and ligaments of the affected joint? The muscles of the thumb can certainly not, as active agents, exert any serious influence in preventing the reduction; for cases have occurred where the luxated phalanx was literally torn away in unsuccessful attempts of this kind. In dislocation of the jaw, the principal obstacle to the reduction is the zygomatic process of the temporal bone; and, although the temporal, pterygoid, and other muscles usually contract with great power, yet this would rather tend to favor the reduction than to prevent it if the condyle of the bone were not firmly locked in the fossa below. The obstacle which bony prominences offer to replacement is well shown in the luxations of the shoulder and hip, the former being always comparatively easy of reduction, on account of the smooth and shallow state of the margin of the glenoid cavity, while the latter, in consequence of the opposite state of the rim of the acetabulum, are generally comparatively difficult. This resistance, however, is always, other things being equal, most striking in the ginglymoid articulations, owing to the greater complexity of their structure, and their larger size, but more especially to the greater number and bulk of the neighboring prominences and depressions, thus permitting the displaced bone to become more readily interlocked with the fixed one.

A serious barrier to reduction is often afforded by the ligaments, caused by the small size or the peculiar shape of the rent made at the time of the accident, the bone passing readily through it, but being unable to return on account of the manner in which it is girt by the edges of the aperture; the membrane or cord being drawn over its neck like a purse with its string tightened. That this frequently happens in the capsular ligaments, in luxations of the orbicular joints, may readily be imagined when we take into consideration the difficulty of effecting reduction, however thoroughly the system may be relaxed, while, in regard to the funicular ligaments, or those of the ginglymoid articulations, the fact is abundantly attested by daily experience.

Finally, it is extremely probable that the reduction of certain dislocations is materially impeded, if not at times prevented, by the head of the displaced bone becoming entangled among the neighboring muscles or tendons, producing an effect similar to that occasioned by the ligaments and bones.

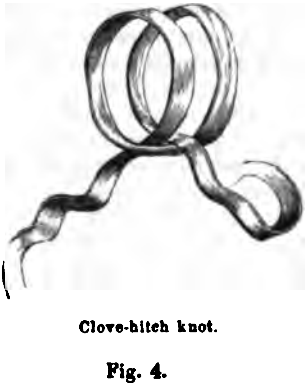
The means which are usually employed for surmounting these several obstacles, consist of certain manipulations or manœuvres, as extension and counter-extension, aided, if necessary, by pressure and thorough relaxation of the system.

Occasionally mere pressure, if properly directed, is sufficient to effect reduction, especially when the dislocation is seated in a joint with loose ligaments, or when the ligaments are extensively lacerated and the neighboring muscles are in a passive, crippled, or paralyzed condition. In general, however, more or less extension and counter-extension will be required, and the mode of applying and conducting these becomes, therefore, a matter of paramount consequence. Upon these subjects much diversity of sentiment has existed among writers, some contending for one mode of practice, and others for another, as though it were possible to lay down any specific rules upon points of treatment which must necessarily vary according to the exigencies of every particular case. My own experience is that it is generally best to apply the extending power to the bone which is articulated with the luxated one, or, in other words, as far as possible from the site of injury. Many highly respectable authorities, however, select the distal portion of the displaced bone, under the supposition that it affords a more direct and influential leverage. In not a few instances, indeed, we are obliged to adopt this course from necessity, the nature of the case not admitting of any choice; as, for example, in dislocations of the wrist and elbow, and in the corresponding ones of the inferior extremity.

Extension and counter-extension may be made by the hands of intelligent assistants, aided, if requisite, by lacs, napkins, or sheets, or by means of pulleys. As a general rule, the resisting power, or the counter-extending means, should be fully equal to the extending, and both should be applied in such a manner as to create as little inconvenience and pain as possible; they should be exerted slowly and gradually, and at the same time continuously, the object being not to fret the muscles which oppose the reduction, but to fatigue and exhaust them. Hence any sudden and violent movements would only be followed by mischief. With regard to the extension, it should always be first made in the direction of the luxated bone, but in proportion as the resistance is overcome the limb should gradually be brought back to its natural position.

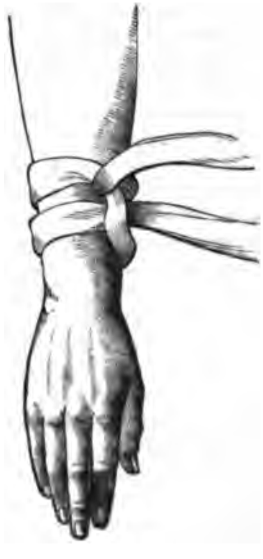
During the reduction the patient may sit up or lie down, as may be most convenient, or as the exigencies of the case may seem to demand. Whenever chloroform is administered, recumbency is indispensable, for the reasons already several times mentioned. As a general rule, the patient should lie upon a bed or table during the reduction of nearly all the dislocations of the principal articulations, especially those of the shoulder, hip, and knee; in those of the elbow, hand, ankle, clavicle, and jaw, on the contrary, it will be found most convenient for the surgeon to have him sit up. The number of assistants must vary from one to three, four, or five, according to the nature of the case, and it will be of great benefit if their duties are always accurately defined before the operation is entered upon, otherwise delay, annoyance, and embarrassment will be sure to be the result. The counter-extending band, which generally consists of a folded sheet, a jack-towel, or, what is better, a long stout piece of muslin, should be fastened round the trunk or limb so as to diffuse its pressure over a considerable space, without the risk of injuring the soft parts, exciting the muscles in the neighborhood of the dislocation, or interfering mechanically with the return of the luxated bone. The extending band must also be secured with great care.

Fig. 2.



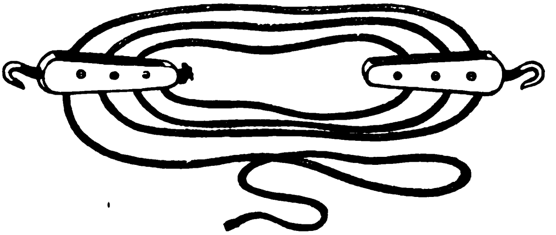
Clove-hitch knot.

Fig. 3.



Clove-hitch knot applied.

Fig. 4.

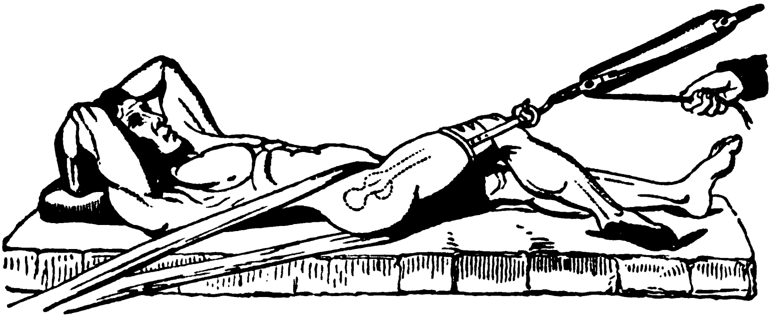


Compound pulleys.

The best plan is to envelop the surface of the limb to which it is to be applied with a soft wet napkin, folded, and passed round at least twice. This answers the double purpose of protecting the skin and of preventing the noose or lac from slipping, which seldom fails to happen if we use a dry cloth. The lac should be of sufficient strength not to break, and should be fastened round the napkin by means of the clove-hitch, or sailor's knot, the proper method of making which will readily be understood by a reference to the accompanying sketches, fig. 2 and fig. 3. Or, instead of this, we may use the French knot, which is equally efficient, and which is executed by placing the band across the limb so as to form a loop on each side, each end being then passed under the limb through the opposite loop. In the more simple forms of dislocation, the requisite extension and counter-extension may be made with the hands, or by the pressure of the heel, knee, or fist.

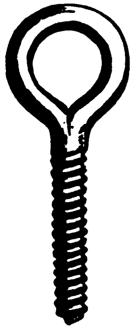
Pulleys, fig. 4. are rarely required in the present improved mode of reducing dislocations, the use of anæsthetics and the "manual method," as it is termed, having well nigh rendered their application unnecessary in all recent cases of the accident. I have myself not had occasion to employ them for several years, and there is reason to believe that, as the profession becomes better acquainted with the nature of the subject, they will ultimately be almost entirely dispensed with. There is no doubt that they have done immense mischief, even in the hands of otherwise judicious surgeons, and that they as often impede as favor reduction. A formal description of this instrument will be unnecessary here, as its appearance and office, known to every one, will easily be understood from the annexed representation, fig. 5. During its application the patient should be recumbent, one hook being fastened to a staple, fig. 6. in the floor or wall, and the other to the noose in the lac encircling the limb. The cord should then be tightened, either by the surgeon himself, or by a trustworthy assistant, the operation being performed with all possible care and gentleness, so as not to endanger fretting of the muscles, fracture of the bones, or rupture of any of the soft parts.

Fig. 5.



Pulleys applied.

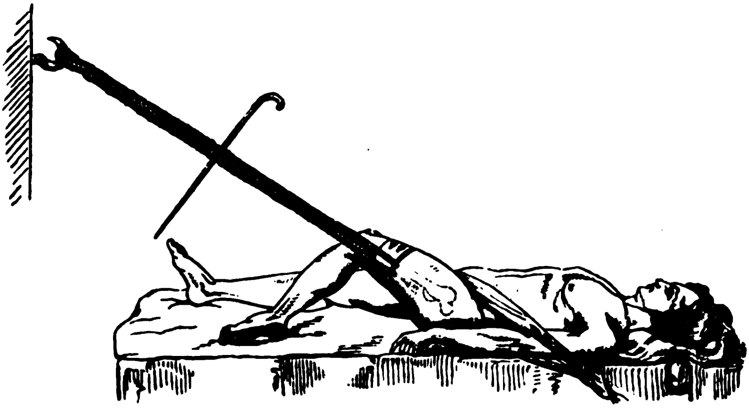
Fig. 6.



Staple.

A very ingenious contrivance, serving as a ready and efficient substitute for the pulleys, has been suggested by Professor Gilbert. It consists in the use of a thin but strong rope, from four to eight strands of which are passed under the extending band, and doubled upon themselves. The free extremities are then drawn tightly, and secured to a staple in the wall. A stick is next carried across the centre of the strands, and revolved upon its axis as a double lever. In this manner a single assistant may furnish any amount of power that may be necessary for gradually and steadily overcoming muscular action, while the surgeon himself attends to the dislocated bone. The annexed cut, fig. 7. affords a good illustration of the apparatus as applied to the subject.

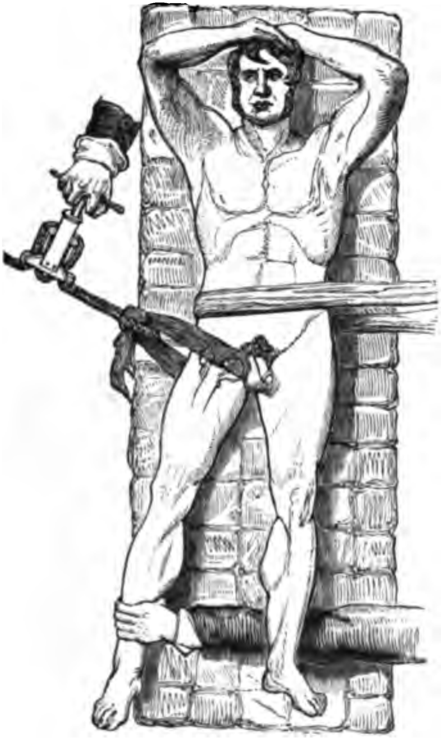
Fig. 7.



Dr. Gilbert's mode of extension and counter-extension.

Another instrument of great power is the dislocation tourniquet devised by Mr. Bloxam, of London, represented in fig. 8, and which, although it acts upon the same principles as the multiplying pulleys, is a more convenient as well as a safer contrivance, capable of affording real aid in drawing the bone into its natural position in cases of unusual muscular resistance.

Fig. 8.

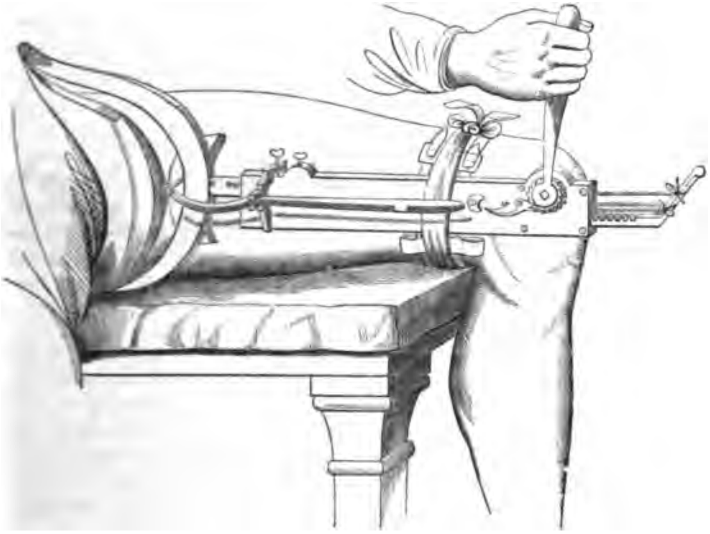


Bloxam's dislocation tourniquet.

Of the surgical adjuster, invented by Dr. Jarvis, I have but little to say; I have never employed it in recent dislocations, and in the repeated trials which I have made with it in those of somewhat long standing it has not been my fortune to meet with any marked success. It is an instrument of extraordinary power, and should, therefore, be used with great care and discretion. In the hands of its ingenious inventor it has doubtless been productive of benefit. Fig. 9, represents the adjuster as applied for the reduction of a dislocation of the hip-joint.

As the resistance of the muscles is one of the chief barriers to the reduction of dislocations, means, to which the term *auxiliary* is applied, are generally at once resorted to with a view to its counteraction. These means are both local and constitutional, and are particularly necessary in strong, robust individuals. The most efficient remedies of this class, formerly at the disposal of the surgeon, were copious bloodletting, usually carried to syncope, nauseating doses of tartar emetic, the warm bath, and the liberal use of anodynes. Sometimes the disgusting practice of intoxication by alcoholic liquor was pursued; and Dr. Physick occasionally advised the smoking of tobacco to bring about the desired relaxation. Since the introduction of chloroform and ether nearly all such means have become obsolete, these articles having very properly taken their place. Even bleeding is now seldom necessary, except occasionally where, from the excessive muscularity of the patient, unusual difficulty is expected, or where, from the injury sustained by the soft parts, it is important to employ at once active measures for preventing excessive inflammation. Tartar emetic, the warm bath, and tobacco have justly been proscribed. The patient is anæsthetized in the usual manner, and all manipulative action is withheld until the system is completely relaxed and the mind rendered unconscious, when the operation is at once proceeded with, the action of the remedy being gently maintained until the object is accomplished. I have pursued this practice in every case of dislocation that has fallen under my notice during the last fifteen years, and have had every reason to be satisfied with the result.

Fig. 9.



Jarvis's adjuster, applied for the reduction of a dislocation of the hip-joint.

When a surgeon is called to a case of dislocation immediately after it has happened, he may occasionally succeed in effecting his purpose by taking advantage of the faint and relaxed state in which he finds the patient in consequence of the shock he has sustained. At other times, again, he may succeed by diverting the patient's attention, either by engaging him in conversation, or by a sudden expression of surprise, while he makes a forcible attempt at reduction. The mere idea of pain is generally sufficient to excite the muscles to spasmodic action, so as to oppose the efforts of the surgeon at restoration. It was, therefore, formerly a matter of great consequence to prevent this by a playful remark, an impertinent question, or an angry reply, calculated to distract the attention of the sufferer, and to throw the muscles off their guard. Dupuytren is reported, upon one occasion, to have employed a similar, though less polite, expedient. Having been called to a lady of rank on account of a dislocation of the shoulder, he was for a long time foiled in his efforts; the assistants pulled, he pushed and pressed, and the patient shrieked and offered every possible resistance. His temper became ruffled; he tried in vain to distract her attention. At last, said he, "Madam, I have repeatedly asked you how this accident has happened, and you have as constantly deceived me; you have not informed me that you had been drunk." The woman, shocked at the remark, indignantly asked, "Who has told you so?" "Your son, madam." The poor patient was stupefied, all the muscles became instantly relaxed, and in a moment the luxation was reduced.

As soon as the system is properly relaxed the surgeon proceeds to the reduction, trusting either to his own personal efforts, or employing such aids as he may consider the exigencies of the case to require. When the extension and counter-extension have been kept up for some time, bringing thus the head of the displaced bone gradually nearer and nearer to its socket, he should grasp the part firmly with his hands, and thus assist in lifting it into its natural position. Or he may accomplish this by means of a band or fillet thrown across his neck and shoulder, while he makes strong and steady pressure against the head of the bone, pushing it back in the direction of the luxation, or towards its fellow. In many cases the reduction will be facilitated if, at the moment the bone approaches its socket, the limb is rotated upon its axis, carried towards the body, or drawn over the opposite limb. When the replacement threatens to be unusually troublesome, the ingenious surgeon will not fail to employ all kinds of expedients and stratagems to accomplish his object, rather than abandon the patient to his fate with a useless limb.

From the facts that have been published within the last fifteen years, it is obvious that most recent simple dislocations of every joint in the body may be thoroughly and expeditiously reduced by manipulation alone, especially if the patient is completely chloroformized. Dislocations of the ileo-femoral articulation have already, in numberless instances, been successfully managed in this manner, and no expert surgeon at the present day thinks of employing any other method. The treatment which Dr. Reid so happily effected for this joint has been extended to luxations of the shoulder, with a result which leaves no doubt that simple manipulation, if properly applied, will generally be fully adequate to the accomplishment of the object. Difficulty will be likely to occur only, or chiefly, in those cases of displacement in which the head of the bone has slipped through a very narrow opening in the connecting ligament, grasping the bone with extraordinary firmness, and so impeding its return to its proper position. Further remarks upon this subject will appear in the sections on dislocations of the hip and shoulder.

The return of the head of the dislocated bone to its natural situation is indicated by the restoration of the shape and motion of the joint; by a snap or noise heard at the moment of the reduction, but which is always very faint when the patient has been anæsthetized ; and by a great and sudden diminution of pain.

Finally, it is always extremely desirable, as soon as the nature of the accident has been clearly ascertained, to effect the reduction as speedily as possible, even although there should be considerable inflammation and swelling, and, consequently, a probability of inflicting severe pain ; for it is much better to pursue this course than to subject the patient to the risk of having, by the delay, an irreducible dislocation, of which there must always be some apprehension, especially when the injury involves a ginglymoid articulation. In making these remarks I do not, of course, mean to be understood as saying that there ought to be no exceptions to this procedure ; I should certainly be very loth to attempt replacement if the parts were very tumid and painful ; in such a case it would be better to wait a few days, but only a few days, in the hope of being able, by leeches, saturnine and anodyne lotions, antimonials, and other means, to reduce the inflammation to such an extent as to render the parts more tolerant of the approaching ordeal.

In obstinate cases of dislocation, rendered so by the manner in which the bones are interlocked with each other, and in which the muscles passing over them are stretched like tense cords, the reduction is sometimes greatly facilitated by a resort to *tenotomy*, performed, of course, subcutaneously. The expedient is particularly valuable in dislocation of the tarsal joints, but it may also be advantageously employed in displacement of the larger articulations, especially in those of long standing. The operation has recently been successfully performed in a number of instances, and I am not aware that it has been followed in any by bad results.

After-treatment.—When the reduction is completed, measures must be adopted, first, to prevent a recurrence of the accident, and, next, to limit inflammation, more or less of which must necessarily take place after every injury of this kind, however simple. The former of these objects is accomplished by appropriate bandages, or bandages and splints, with rest in the recumbent position, especially if the injury is seated in the lower limbs; in dislocations, on the contrary, of the upper extremity, the arm should be suspended in a sling, and the patient, after a few days, may walk about in the open air. Inflammatory accession is met by the usual antiphlogistic remedies, both constitutional and topical, among the latter of which evaporating lotions, as spirits and water, and solutions of acetate of lead, along with laudanum, are the best, and they will generally be found most agreeable and beneficial, at least during the first forty-eight hours, if they are applied warm. Whenever the joint is so situated as to admit of the application of the roller, this is on no account to be omitted, as it serves both to support the parts and to prevent swelling. Its effects, however, must be most carefully watched; and the first wrapping must always be very light, lest undue constriction be the result. Pain is subdued by full doses of morphia.

Finally, another object, one, indeed, of paramount importance, is to prevent anchylosis. Hence, as soon as the inflammatory symptoms have abated, passive motion must be instituted, and repeated, steadily and perseveringly, at first once, and afterwards twice, or even thrice, a day, until the functions of the joint are perfectly re-established; an object which can seldom be attained, in any case, under several months, and in some, indeed, not under six, ten, or twelve, depending upon the nature of the joint, the extent of the injury, the character of the treatment, and, above all, the co-operation of the patient, whose conduct has often much more to do with the production of a stiff and useless joint than his surgeon. After the more prominent inflammatory symptoms have disappeared, the absorption of effused fluids should be promoted by soap liniment, or moderately stimulating embrocations, followed, in due time, by the cold douche, dry frictions, and shampooing.

3. COMPLICATED DISLOCATIONS.

A complicated luxation, as stated elsewhere, is one where the displacement is accompanied by a fracture, the rupture of an important vessel or nerve, a violent contusion, or a wound communicating with the cavity of the articulation, or extending deeply among the tissues in its neighborhood. Not infrequently, several of these lesions coexist, thus materially increasing the gravity of the case, and the difficulty of managing it.

A complicated dislocation may, of course, occur in any of the articulations, but it is by far more frequently met with in those of the elbow, wrist, knee, and ankle than in any other, for the reason, probably, that the heads of the bones are less protected there by muscles, and also that they are more sharp or angular, than in the orbicular joints. Hence, when the injury is unusually violent, the articular extremities, losing their ligamentous connections, are apt to be impelled with so much force against the soft parts as to lacerate them from within outwards, dividing muscles, tendons, fasciæ, vessels, nerves, and integument, and perhaps protruding several inches beyond the external wound; or, the vulnerating body, impinging forcibly against the external surface, may commit the mischief from without inwards, the bones being comparatively passive until the moment they are struck, when they, in their turn, may inflict additional injury upon the structures beyond where the projectile does not penetrate. In the great majority of instances, at least in civil life, the lesion is caused by falls, blows, or kicks; in military practice numerous cases of complicated dislocations occur from gunshot injury.

Compound dislocations, as they are commonly called, appear to be very rare in comparison with simple. Thus, in 94 cases of dislocations, reported by Dr. Norris as having occurred in the Pennsylvania Hospital, only 2 were compound; and of 166 cases collected by Professor Hamilton, only 8 were of this description.

Symptoms.—The symptoms of complicated dislocations are usually sufficiently characteristic, and do not, therefore, require any formal description. In general, there will be more or less distortion of the joint, inability of motion, discharge of synovial fluid, and shortening of the corresponding limb, with contusion, dis-

coloration, and ecchymosis of the soft parts. When there is a wound, the
of the bone not infrequently protrudes at the external opening; sometimes
the distance of an inch or two. Crepitus will of course be present when
dislocation is complicated with fracture. Great numbness and partial paraly
will indicate lesion of an important nerve; while coldness of the extremity, w
absence of pulsation in its distal portion, and copious extravasation of blo
will be denotive of serious injury of the principal artery.

Prognosis.—A complicated luxation, as the name implies, is always a seri
injury, liable to be followed by the most dreadful consequences, jeoparding
safety both of limb and life. The resulting inflammation is generally extrem
violent, and is peculiarly prone to lead to abscess, erysipelas, and pyemia, es
cially in persons of intemperate habits, or of a dilapidated system. Under su
circumstances, and sometimes even when the person was in the most perf
health just before the accident, the constitutional disturbance is generally ve
great, delirium sets in early, and the parts are soon seized with gangrene. T
danger of mortification will necessarily always be proportionately great wh
there has been a division of an important vessel or nerve, interrupting circulati
and innervation; pyemia will be most likely to happen when there has be
excessive shock, and necrosis when the protruded or exposed bone has be
stripped of periosteum, broken in pieces, or covered with dirt. But the dang
to limb and life is not limited to the primary effects of the injury; often, after
attempt has been made to save the parts, the surgeon is chagrined to find th
all his efforts have been unavailing, that the patient is gradually worn out
hectic irritation and profuse discharge, and that amputation, now performed
a dernier resort, hardly holds out a single prospect of cure. A guarded pro
nosis, then, is becoming in every case of complicated dislocation, however simpl
if such a term is applicable to such a subject.

Treatment.—Much of our success in these accidents will depend upon t
promptness and efficiency of our treatment, or the manner in which the parts a
managed during and after the reduction, which should always be effected a
speedily as possible, and with as much care and gentleness as the case will adm
of, the patient being fully anæsthetized. If there is a wound, the edges mus
be brought accurately together with strips of adhesive plaster, aided, if necessar
by suture, and smeared over with collodion, to exclude the air. Any loose spli
ters of bone that may be present are to be removed, care being taken not t
interfere with any that are sufficiently adherent to render it probable that, if le
behind, they will reunite. The fingers and forceps will be the best instrument
for performing the operation. If the end of the bone protrude at the wound, i
must at once be restored to its natural position, any dirt that may cover it havin
previously been picked away, or removed with the syringe. Should it be gi
by the integuments, so as to render the reduction impracticable, a circumstance
however, which must be extremely rare, the opening must be carefully enlarge
with the probe-pointed bistoury; and a similar practice should be followed whe
the wound is too small to admit of the easy extraction of loose fragments. I
the end of the bone is very sharp, angular, or denuded of periosteum, it shoul
be cut off with the saw or pliers, but such a step should only be taken after th
most thorough conviction of its imperative necessity; for the same rule applie
here as in the soft parts to save all we can, and sacrifice nothing improperly.
can hardly conceive of a case where it would be necessary to remove the end o
a dislocated bone simply because it protrudes at a wound. If the patient i
completely relaxed by chloroform, extension and counter-extension, with judiciou
coaptative pressure, could not fail to effect restoration, even when the bone i
very tightly girt.

When other means fail to overcome the resistance of the muscles, tenotom
may be employed, as originally practised by Mr. William Hey, in a case of com
pound dislocation of the ankle.

Finally, when luxation is complicated with fracture, the rule is to reduce th
former before the latter is set, for the reason that if the restoration of the join
is postponed until the broken bone is repaired, it will often be impossible t

effect it. Besides, the union might be destroyed under the effort. Under such circumstances, the reduction of the luxation is often greatly facilitated by putting up the fracture firmly in splints, as a longer and better leverage is thus secured.

After-treatment.—The reduction having been effected, the joint and corresponding limb are to be enveloped in a bandage—that of Scultetus being passed round the wounded part—and placed securely in splints, or, what is preferable, in a tin-case, or wooden box, in order to keep it perfectly at rest, and in as easy a position as possible. Pain and inflammation are relieved by the usual remedies; and it is here that anodynes will be likely to display their happiest effects, both in allaying suffering and in preventing serious constitutional disturbance. Antiphlogistics must be employed warily, with due reference to the effects of shock, long confinement, and copious drainage. In a word, the patient must not be purged and bled simply because he has a compound dislocation; on the contrary, such measures, if used at all, must be used with the greatest possible caution. The diet must be rigidly adapted to the exigencies of the case; as in all other severe injuries it should be nutritious rather than otherwise, and instances will often arise where it should be decidedly so from the very commencement of the treatment. The enfeebled patient will often be immensely benefited by the addition of milk punch, whiskey, ale, or porter, especially if he was accustomed to any of these articles previously to the accident. In the event of suppuration or erysipelas, quinine and iron will materially aid recovery, and must not be omitted.

The affected parts must be handled as little and as gently as possible; all officious interference must be refrained from; the secretions are to be removed from time to time with the sponge, and fetor must be allayed with the chlorides. In case of wound, or much discharge, the limb should be placed in bran, which will answer the threefold purpose of maintaining equable pressure, absorbing the secretions, and affording a comfortable bed for the parts to rest upon, with the additional advantage, in hot weather, of preventing the formation of maggots.

Amputation and Excision.—Concerning the propriety of amputation, the same general rules are applicable as in complicated fractures, a subject which has been duly discussed under that head. The following summary, however, will not be out of place here respecting the operation. The reasons for immediate amputation are, first, the excessive contusion and laceration of the soft parts; secondly, the rupture of the principal artery or nerve of the limb, attended with other serious injury; thirdly, an extremely shattered state of the bones; fourthly, free exposure of a large joint; and, lastly, the advanced age, depraved habits, or ill health of the patient. Secondary amputation may be required, when, after an attempt has been made to save the limb, gangrene has taken place, or life is assailed by exhausting suppuration consequent upon extensive disease of the soft parts, the joint, or bones, or of all these parts together. Very great and irremediable deformity of the limb, standing in the way of its usefulness, is also a just cause for amputation.

Instead of amputation, in some of the above cases, excision may occasionally be advantageously employed, either primarily or secondarily. The primary operation is particularly indicated in dislocations complicated with a shattered and comminuted condition of the head of the displaced bone, and has been so often performed beneficially that it may now be regarded as one of the established proceedings in surgery. Its greatest success has been obtained in compound luxations of the shoulder-joint. Even when there is no fracture of the head of the dislocated bone, but simply extensive laceration of the ligaments, completely detaching the parts from each other, it is questionable whether, in many cases, excision would not be the more expedient practice.

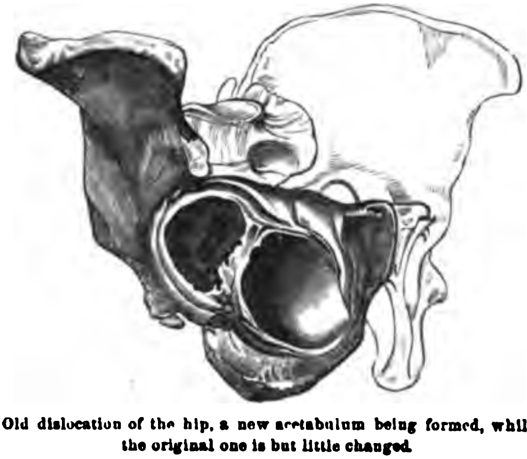
Secondary resection may be employed in caries, or caries and necrosis, of the ends of the bone, coming on after a fruitless attempt to save the parts.

4. CHRONIC, OLD, OR NEGLECTED DISLOCATIONS.

The subject of old, chronic, or neglected luxations has not received the attention which its importance merits. The morbid anatomy of these accidents is still imperfectly understood, no connected body of facts illustrative of it having yet been published, and it is to be feared that their treatment is seldom guided by sound scientific principles. They constitute a class of cases which almost every surgeon approaches with doubts and misgivings, being anxious to do something for the patient's relief, and yet afraid the interference should produce serious, if not irreparable, mischief. I candidly confess that I have always shared these feelings, and that I have never had charge of an old or neglected dislocation without a strong secret wish that it had fallen into other hands, such have usually been my disappointment, and the anxiety attendant upon my efforts at reduction. The risk of rupturing an important vessel, perhaps the main artery of a limb, of breaking a bone, or of exciting extensive suppurative action in the parts around the affected joint, with the more remote chance of inducing pyemia, is well calculated to cause the practitioner to hesitate before he enters upon an enterprise so fraught with unpleasant consequences.

The blood that is effused in dislocations, unless unusually abundant, is generally very soon absorbed, precisely as after other accidents involving subcutaneous hemorrhage. On this account it is very seldom that we have an opportunity of meeting with any in chronic cases; it is only now and then that a small clot or stratum, decolorized, and partially organized, is seen, and even this is almost always eventually carried off. The inflammation consequent upon the lesion is constantly followed by a deposit of plastic matter, both in and around the joint, filling up the socket of the bone, and infiltrating the cellular tissue, muscles, and other structures in the neighborhood. More or less of this substance is also effused around the displaced head, where it is gradually organized, and at length converted into an adventitious capsule, of a pale grayish aspect, and of a dense fibroid texture, not unlike the original capsule, with which it generally communicates by one or more openings, and which, by degrees, becomes wasted and attenuated from want of use. The muscles, in great measure deprived of their functions, are transformed into pale, rigid, contracted bands, which, in time, often undergo the fatty degeneration. The periosteum, near the joint, is usually somewhat thickened, and occasionally studded with osseous stalactites. The cartilage of the affected socket is generally partially absorbed, or more or less changed in its appearance, texture, and consistence, while that which invests the head of the bone exhibits a rough, scabrous aspect, being thickened at one point and atrophied at another, the osseous substance itself often becoming hard and sometimes even eburnized. Few opportunities have occurred of observing the condition of the vessels and nerves in ancient dislocations; in the cases in which this has been noticed, the former were found to be preternaturally flexuous, to accommodate themselves, as it were, to the displaced bone, and the latter somewhat attenuated, but otherwise sound.

Fig. 10.



Old dislocation of the hip, a new acetabulum being formed, while the original one is but little changed.

In those cases in which the displaced head enjoys a good deal of freedom, it generally forms for itself a sort of socket, as in fig. 10, most commonly in a neighboring bone, but sometimes in the substance of a muscle, or partly in the one, and partly in the other. This socket, however, although it may admit of considerable motion, is a very imperfect type of the original, as is also the new ligament by which it is surrounded.

In addition to the changes now described, and which, it will be perceived, relate exclusively to the articular structures and to the parts immediately around, changes which are usually the more conspicuous in proportion to the duration of the dislocation, it will be found that the whole limb below the seat of the injury, and sometimes even for some distance above it, has a shrunken and withered appearance, its muscles being thin, flabby, and wasted, and its temperature materially diminished. In many cases it is affected with rheumatic or neuralgic pains, subject to aggravation with every change of the weather and with every disorder of the general health. The motion of the new joint is necessarily much restricted, and is often performed with a peculiar grating noise and sensation, caused by the roughened state of the contiguous surfaces, and the entire absence of synovial fluid. When all motion is lost the joint gradually undergoes complete bony anchylosis.

It has long been a question with surgeons at what period after the occurrence of a dislocation it should be considered as impracticable to effect reduction. The question, as might have been expected, has been differently answered by different observers, and by the same observers for different joints. Thus, Sir Astley Cooper, who has always been regarded as the leading authority upon the subject, thought that three months for the shoulder, and eight weeks for the hip, might be set down as the limit, beyond which any efforts of this kind, except in persons of very lax fibre or advanced age, would be highly imprudent; an opinion which accords so well with general experience as, in my judgment, to entitle it to be considered as a law. It cannot be denied that this law has exceptions; but this only serves the more fully to establish its validity. Thus, in relation to at least one of the joints in question, that of the shoulder, quite a number of cases have been reported of reduction at from four to seven months after the receipt of the injury. Indeed, Dr. Nathan Smith, of New Haven, met with one in which he succeeded completely nearly one year after the accident. Examples of reduction of dislocations of the hip-joint from three to six months' standing have also occurred, although it will be found, upon careful inquiry, that their number is exceedingly small.

For the ginglymoid articulations the period is still more limited, although, in this respect, it varies a good deal among themselves. In relation to the elbow-joint, which is the best type of the ginglymoid class, I have found, in quite a considerable number of cases, that any attempts at reduction, however perseveringly or judiciously continued, will generally prove completely abortive after the third week. On the contrary, the wrist-joint may generally be rectified at a considerably later period. These differences in the reducibility of dislocations of different articulations are due altogether to peculiarities of structure and to the amount of inflammation consequent upon the injury. The surfaces of the orbicular joints are comparatively smooth and simple, and their displacements are seldom followed by much inflammation; the reverse in both particulars being true in regard to the ginglymoid joints.

Evidently, then, every luxation must rest, so to speak, upon its own merits, as far as the question of its restoration is concerned; for, as has just been stated, while one joint becomes irreducible in a fortnight or a month, another, differently constructed, may remain reducible eight weeks, or even a much longer period. A far better rule by which to decide this question is to judge by the extent of motion of the affected bones, the previous attempts at replacement, and the degree of inflammation consequent upon the injury. If the joint is very stiff and tender, if the luxated head has contracted firm adhesions, involving, perhaps, a large artery, or some other important structure, and if, in addition to this, there is reason to believe that the socket is filled up with new matter, any effort at reduction would not only prove abortive, but might be followed by very serious accidents, jeoparding limb and life. Cases in which severe injury and even death have been the consequence of long-continued and violent attempts at reduction have happened to surgeons of great experience and eminence, and should serve as warnings to the young practitioner against the employment of undue force where the prospect of success is at all doubtful.

The conduct to be observed in the reduction of chronic dislocations resolves itself into a few simple rules. In the first place, it is necessary, as an important preliminary, to prepare the part, as well as the constitution, for the operation, by the systematic movement of the joint, and by light diet and purgatives, aided, if the person is at all strong and plethoric, by at least one large bleeding. The object of this depletion is not merely to weaken the muscles, but to lessen the risk of severe inflammation and the formation of abscesses. The motion of the joint is intended to break up any abnormal adhesions that the bone may have contracted with the surrounding tissues, and should be conducted with great care and gentleness, the corresponding limb being carried about in different directions, flexed, extended, depressed, elevated, adducted, abducted, rotated, and circumducted; the operation should not be performed, at first, oftener than once a day, but by degrees it may be repeated every twelve hours, and it should be steadily continued for at least a fortnight, free use being made all along of evaporating and sorbefacient lotions, with minute doses of mercury, administered to the extent of slight ptyalism.

The preliminary treatment having been gone through with, and the patient being thoroughly anæsthetized, the extension and counter-extension are to be conducted in the usual manner, only with more care and patience, and with an additional number of assistants. The object is, not as in recent luxations, to fatigue the muscles, but to extend and stretch their fibres, shortened, hard and tense in consequence of long-continued disease and inflammatory irritation. In no event should the surgeon employ violent or forcible measures, because such a procedure would be sure not only to increase the resistance, and, as a necessary result, the difficulties of the reduction, but be very likely to cause dangerous laceration of the soft parts, and secondary mischief. Should the operation fail, it must not be too soon repeated, but some time must elapse before another attempt is made, special attention being meanwhile paid to the suffering joint in the way of support and fomentation. The rupture of an important artery, as, for example, the axillary in dislocation of the shoulder, will be denoted by a rapid effusion of blood into the connecting cellular tissue, discoloration of the integuments, and cessation of pulsation in the distal portion of the limb. The proper remedy, in such an event, is immediate ligation of the affected vessel, and the avoidance, of course, of further interference. Should fracture occur, the operation must also at once be suspended, and the case treated upon general principles.

In order to facilitate the reduction of old dislocations, resisting the ordinary efforts, Dieffenbach, many years ago, proposed the subcutaneous division of the muscles concerned in opposing the restoration of the bone, and such an operation has been repeatedly performed, though rarely with the advantage that had been anticipated. I have myself occasionally employed it, but never with any decided benefit. The great objection to the procedure is the danger of wounding important structures, especially large vessels and nerves, which are very often greatly displaced, and which, if injured, might occasion serious consequences. No one, therefore, should undertake such an operation unless he has the clearest possible conceptions of the anatomy of the parts, and is fully prepared to meet any emergency that his knife may produce.

5. CONGENITAL DISLOCATIONS.

There are certain dislocations which exist at birth, and which are, therefore, denominated congenital. Their occasional occurrence, recognized at an early period of the profession, has been satisfactorily established by a number of modern observers, especially by Chaussier, Paletta, Dupuytren, Breschet, Pravaz, R. W. Smith, Guérin, and Carnochan.

Different joints are liable to this variety of luxation, but its occurrence is by far most common in those of the hip, wrist, and shoulder. The lesion, although generally single, is sometimes double, that is, it exists simultaneously in the two opposite articulations. Occasionally it occurs in different joints in the same subject, as, for instance, in the shoulder and wrist, or in one of these joints and in that of the hip. Both sexes are liable to it, but by no means in an equal degree, observation having shown that females suffer much more frequently than males, in the proportion, as nearly as can be ascertained, of at least three to one. This is a very curious fact, too constant to be altogether dependent upon chance. Of twenty-six cases of congenital dislocation of the hip, noticed by Dupuytren, not above four occdrred in males.

Congenital luxation is sometimes hereditary. Several instances have been recorded in which it appeared in a number of successive generations, and also in several members of the same family.

Causes.—The causes of congenital dislocations have excited much attention, as well as a great deal of controversy, without eliciting any positive results. The various theories that have been advanced in explanation of this vexed subject may be arranged under the following heads: 1st, external violence inflicted upon the fœtus; 2dly, disease of the articulations; 3dly, arrest of development.

1st. There can be no doubt that undue force exerted upon the fœtus, whether from without, as when the mother receives a fall or blow upon the abdomen, or from inordinate contraction of the uterus, is capable of inducing partial dislocation of the joints, or, at all events, such a state of the articulating surfaces as to predispose them strongly to its occurrence. It is well ascertained that external violence is capable of producing fracture of the fœtal bones; I have myself seen several unmistakable examples of this kind, and Chaussier has recorded a remarkable case in which this lesion coexisted with congenital luxation of the hip and shoulder joints. It is extremely probable that a deficiency of the amniotic liquor may predispose to this occurrence, by enabling the womb to exert its contractile force more readily and fully upon the fœtus, thus forcing the articulating surfaces away from each other at a time when they are too imperfectly developed to resist such pressure, especially if frequently repeated. A theory of the formation of club-foot, which is probably nothing originally but a partial displacement of the tarsal joints, has, as is well known, been founded upon this supposed contractile power of the uterus, and of its injurious influence upon the fœtus. Finally, there is reason to believe that what is termed a congenital luxation is occasionally produced by violence inflicted upon certain joints during delivery, in rude and forcible attempts to bring away the extremities.

2d. The second theory rests upon the idea that the lesion may depend upon disease of the joints, awakened prior to the child's birth. This is extremely plausible; at all events, it is impossible not to be impressed with the conviction that disease may occasionally be followed by such a result, if not directly, at any rate by inducing relaxation of the ligaments, and so favoring the action of the muscles in separating the articular surfaces. Children in the womb are, it is well known, liable to numerous affections, some of them of a highly inflammatory character, terminating at one time in death, and at another in serious and irremediable deformity. Of these affections, synovitis is one, and it is probable that it generally has a gouty, rheumatic, or syphilitic origin.

3d. The theory of an arrest of development has many advocates, both in regard to the origin of this and of other affections; but what do we know of it? Certainly nothing beyond the fact that it is expressive of the imperfect growth of a part, and of the concomitant deformity; it affords no clue whatever to the nature of the causes, either remote or proximate, that induced it. The fault may exist in the germ, or it may be superadded to it after conception, in consequence of some intrinsic defect, or as a result of the operation of causes acting through the mother.

Morbid Anatomy.—The pathological changes accompanying this lesion are numerous and diversified. In the first place, the displaced articular extremities are generally deprived, in part, if not entirely, of their natural shape and structure; they are rounded off, divested of synovial membrane and cartilage, atrophied, and otherwise altered. The deepest cavity, as, for instance, the cotyloid, often completely disappears, not by being filled up with plastic matter, as in traumatic luxation, but by the absorption of its component elements. Very frequently the displaced bone forms a new socket, generally superficial, but quite sufficient for the amount of motion to which it is restricted. The ligaments are elongated and relaxed, thin, ribbon-shaped, partially wasted, or completely destroyed; occasionally, however, instead of being stretched and attenuated, they are very short, tense, and strong, obviously from interstitial deposits. The surrounding muscles are either pale, wasted, and partially transformed into fatty matter, or they are unnaturally large and stout, from the increased exercise devolved upon them by the dislocated bone.

Symptoms.—The symptoms of congenital dislocation are characteristic. The affection, manifesting itself in various kinds of deformity, is noticed at, or soon after, birth, having commenced without any apparent violence; it is unattended with pain, or, if pain is present, it is much less than in the traumatic form of dislocation; the swelling also is inconsiderable, if, indeed, there is any at all; the head of the bone can be felt in its abnormal position, and the portion of the limb connected with it is generally singularly distorted, being changed in its axis, flexed, extended, or twisted. Motion is either much impeded, or too free; the affected member is commonly somewhat shortened, and more or less attenuated, from the wasted condition of its muscles. By extension and counter-extension the displaced surfaces may generally be easily restored to their natural position, but the moment they are discontinued they resume their former condition. This is practicable, however, only in the younger class of subjects; in old cases, reduction is always proportionately difficult, often impossible. The deformity invariably increases with age, and is sure to be followed by an arrest of growth of the surrounding structures.

Prognosis.—The prognosis is altogether unfavorable. This is particularly true of the lesion when it is of long standing, as when the person has attained the age of puberty or of manhood, when no plan of treatment that has yet been devised can be of any material, if, indeed, of the slightest, avail, owing to the impossibility of effecting accurate adjustment of the articular surfaces, in consequence of the organic changes which they have undergone. Even under the most propitious circumstances, as it respects age and preservation of structure, the difficulties of effecting a permanent cure will generally be extremely great, well calculated to exhaust the patience both of the subject and the surgeon. The prognosis should, therefore, always be very guarded.

Treatment.—From what has just been stated, it is evident that the sooner the treatment of this lesion is commenced the more likely will it be to be successful, or, if not altogether successful, productive of amelioration. The principles which should guide the practitioner do not differ essentially from those which govern him in the traumatic form of the accident. The two leading indications obviously are to effect reduction, and to prevent a recurrence of the displacement. No difficulty is generally experienced in fulfilling the former, especially in very young and tender subjects; it is the latter that causes all the trouble, annoys the patient, and frets the surgeon. Various kinds of apparatus, much of it of a very complicated and expensive character, have been devised for retaining the parts in contact after they have been restored; but it admits of doubt whether most of it could not advantageously be replaced by more simple means, such as ordinary splints, wire cases, and adhesive strips and rollers, which might be so applied, as, in most cases, to answer the purpose most perfectly. Permanent extension and counter-extension will be required when there is retraction of the dislocated bone. Long confinement, however, should always, if possible, be avoided, as it is of paramount importance to preserve the general health. The principal local remedies, worthy of attention, are the cold douche and friction with ammoniated and other liniments, together with direct support. If the patient is feeble and anemic, benefit will accrue from the use of tonics, as iron and quinine, a nutritious diet, and exercise in the open air.

When the reduction of these dislocations is opposed by the permanent contraction of the muscles, the only way to overcome the obstacle is tenotomy. The case should afterwards be treated upon the same principles as in club-foot.

SECT. II.—DISLOCATIONS OF PARTICULAR JOINTS.

1. HEAD AND TRUNK.

DISLOCATIONS OF THE HYOID BONE.

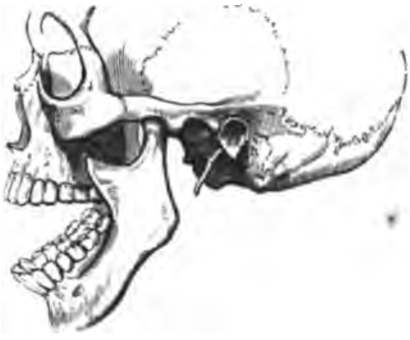
The possibility of a dislocation of this bone, at one time strenuously denied, has of late years been attested by a number of well-authenticated examples. In 1848, Dr. Ripley, of South Carolina, read a paper upon the subject before the Medical Society of Paris, in which he described such an accident as having occurred in his own person; and more recently, Dr. Gibb, of England, has published a communication in which he declares that he has seen not less than four cases of it, all of them in the male sex. In one of these there was an occasional displacement of the left horn of the hyoid bone, the patient perceiving a sudden click in that part of his neck, and a sensation as if something were sticking in his throat. He at length died of phthisis, when it was ascertained that the thyro-hyoid articulation contained, besides a considerable quantity of clear fluid, a large sesamoid bone, the whole arrangement being such as to admit of an extraordinary amount of motion.

The reduction of this dislocation is effected by throwing the head backwards as far as possible, so as to put the muscles of the neck completely on the stretch, and then relaxing the lower jaw, at the same time that gentle pressure is made upon the displaced part. The bone, in the case of Dr. Ripley, always returned with a click.

DISLOCATIONS OF THE JAW.

The connection between the lower maxillary and temporal bones is established by a hinge-joint, each condyle of the former moving upon an interarticular cartilage, and being held in place by two ligaments. Luxation, therefore, can occur only in one direction, that is, forwards and downwards, the condyle slipping off the articular eminence of the temporal bone into the zygomatic fossa, as in fig. 11. The displacement is usually double, affecting both sides simultaneously, and is commonly produced by some sudden, spasmodic contraction of the muscles in yawning, laughing, vomiting, or convulsions. Dorsey has recorded the case of a female who luxated her jaw in the act of scolding her husband. The accident has sometimes happened in an attempt to extract a tooth, to bite a large apple, or to crack a nut. Occasionally it occurs in consequence of a blow, fall, or kick upon the chin, the mouth being widely opened at the moment, and the condyle advanced forward upon the articular eminence. In 1861, I saw a female, aged twenty-nine, a patient of Dr. Emile Fischer, who dislocated her jaw on both sides in an attempt, during an attack of delirium, to pull the tongue out of her mouth. More frequent in women than in men, and in middle-aged and delicate subjects than in the old and robust, it is extremely rare in young children, owing to the peculiar conformation of the body and branches of the jaw rendering the occurrence one of great difficulty.

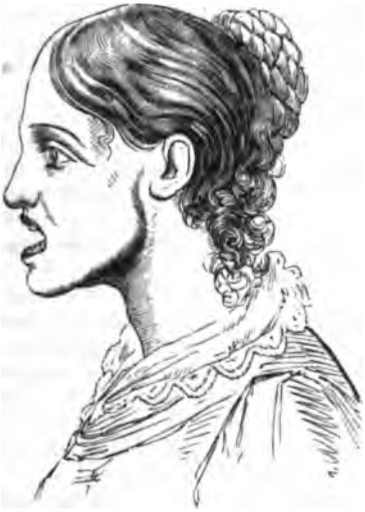
Fig. 11.



Double dislocation of the lower jaw.

The *symptoms* of the lesion are generally characteristic. The mouth, as exhibited in fig. 12, is widely opened, and cannot possibly be closed; the chin is unusually prominent, and the lower line of teeth projects considerably beyond the upper; the saliva, increased in quantity, dribbles off involuntarily; deglutition and speech are performed with great difficulty; the cheeks and temples are flattened, and, as it were, elongated; the coronoid process is easily distinguishable in the zygomatic fossa, especially if examined through the mouth; and, instead of the natural prominence formed by the external condyle immediately in front of the ear, there is a distinct vacuity capable of receiving the end of the finger, although not without some effort, owing to the great tension of the integument. When the displacement has existed for some time, the symptoms will be less marked, but still sufficiently characteristic to prevent mistake, provided the surgeon will take the requisite care to inform himself of the history of the case and the actual condition of the jaw and mouth.

Fig. 12.



Dislocation of the jaw.

Although the *diagnosis* of this dislocation is generally quite easy, a very ridiculous error has occasionally been committed. Thus, I recollect a case which happened many years ago, where a middle-aged woman, in an attack of cholera, luxated the lower jaw in the act of vomiting, and, when she recovered her consciousness, was unable to shut her mouth. A physician, a man of eminence, passing by soon after, was induced to consider the case as one of tetanus. The next day a surgeon was called in, who, at once detecting the nature of the lesion, restored without difficulty the parts to their natural relations. An attack of apoplexy, attended with paralysis of the muscles of one side of the face, has been mistaken for a unilateral dislocation of the inferior jaw.

When the luxation remains unreduced, the jaw gradually regains a part of its motion, the dental arches approaching each other, so that eventually the patient may even be able to masticate his food; speech and deglutition also improve; the saliva ceases to dribble; and much of the disagreeable deformity disappears.

The *reduction* is effected by seating the patient upon the floor or upon a low stool, his head being supported upon the breast of an assistant. The surgeon, standing in front, introduces his thumbs, carefully defended with a piece of roller, into the mouth, as far back upon the large grinders as possible, while he places the fingers of each hand under the chin and base of the jaw. Using now each thumb as a fulcrum, he forcibly depresses the back part of the jaw, to disengage the condyles from their position in the zygomatic fossæ, and at the same moment elevates the chin with his fingers, thus converting the bone into a lever of the first kind. The return of the condyles to their natural situation is generally effected by a loud snap, and the instant it is about to occur the surgeon quickly removes his thumbs from the teeth, lest, in the act of closure of the jaws, they be seriously injured by the suddenness and violence of the contraction.

Such is the mode of reduction usually recommended by writers; in my own practice, however, I find that the operation is greatly simplified by the use of anæsthesia, which, while it completely relaxes the muscles, obviates the necessity of removing the thumbs from the jaw as the bone is sliding noiselessly into its place.

A very simple and efficient method of reducing dislocations of the lower jaw has been recommended by Mons. Nélaton. The patient being seated upon a chair, and the mouth widely opened, the surgeon, standing behind him, plants his thumbs upon the upper part of the nape of the neck, and then with the fingers, pushes the jaw forwards by pressing against the prominence formed on each side of the cheek by the point of the coronoid process. A small amount of force generally suffices to effect the object, the condyles returning with a distinct snap. When the resistance is unusually great, the head may be supported by an assistant, or a band may be passed round it, in which the operator engages his fingers, while the thumbs, resting upon the cheeks, are made to bear upon the coronoid process from above downwards, and from before backwards.

The older surgeons were in the habit of reducing luxations of the lower jaw by placing between the molar teeth two pieces of cork or wood which they used as levers to depress the back part of the bone, while they raised the chin by means of a bandage. Another method, occasionally employed by them, consisted in pressing a stick against the lower grinders, so as to keep the jaws separated until the irritated and contracted muscles, overcome by fatigue, allowed the condyles to glide into their natural situation.

In *unilateral* displacement of this bone, the chin is thrown towards the opposite side; the front teeth lose their parallelism; the mouth is opened, but less widely than in the double luxation; speech and deglutition are somewhat impeded; and the depression in front of the ear is perceptible only on the injured side. The reduction is effected upon the same principle as in the other form of the accident, with this difference merely that only one thumb is used.

After either of these luxations, but especially the bilateral, the patient should for some time avoid opening his mouth, as the accident is extremely liable to recur from very slight causes. The safest plan, therefore, is to support the jaw with an appropriate bandage, as that, for example, used in fracture. During the first few weeks the nourishment should consist exclusively of slops and other articles not requiring mastication.

In *neglected cases* of this dislocation the reduction will generally be found to be very difficult even as early as the end of the third or fourth week. Occasionally, however, the reverse is the case. Thus, in an instance reported by Mr. Donovan, restoration was successfully effected on the ninety-eighth day. Where the ordinary means fail, instead of abandoning the patient to his fate, the efforts at reduction should be aided by the subcutaneous section of the external pterygoid, masseter, and temporal muscles.

Sub-luxation.—There is a species of displacement occasionally met with in the lower jaw, which was first described by Sir Astley Cooper under the name of sub-luxation, and which depends, apparently, upon an unusual laxity of the ligaments, permitting the condyle to slip off from the interarticular cartilage. It is most common in weak, delicate females, and is characterized by an inability to close the mouth, with more or less pain, and a feeling of tension on the injured side. The bone generally returns of its own accord, but, should it not, replacement may easily be effected by drawing the jaw slightly forwards and downwards, so as to afford the condyle an opportunity of reinstating itself upon the interarticular cartilage. When the relaxation of the joint is very great, the case should be treated by tonics, as iron and quinine, the cold shower-bath, electricity, exercise in the open air, and the application of a series of little blisters over the affected part.

Congenital Dislocation.—A congenital dislocation of the lower jaw has been observed in a few cases, Mr. Robert W. Smith having been the first to notice such an accident, of which he has given, with great minuteness, the results of the dissection. The patient, an idiot from infancy, died at the age of thirty-eight. The luxation existed on the right side, which was remarkably deformed, having a singularly hollow appearance, which strikingly contrasted with that of the sound one, which was unusually full and plump. The extremity of the finger could be readily pressed between the posterior margin of the jaw and the external auditory canal, owing, as was found on dissection, to the absence of the condyle of the bone, which was, in fact, greatly atrophied nearly as far forward as the symphysis. There was no interarticular cartilage, or distinct capsular ligament; and both the masseter, pterygoid, and temporal muscles were much wasted. The temporal, malar, superior maxillary, and sphenoid bones were imperfectly developed, and the glenoid cavity existed merely in a rudimentary state.

DISLOCATIONS OF THE CLAVICLE.

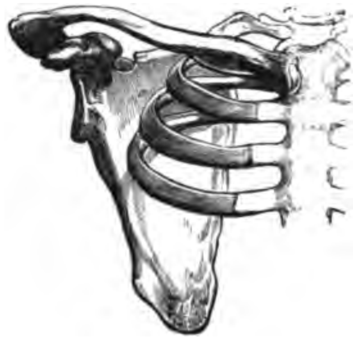
Dislocation of the clavicle, compared with fracture of this bone, is extremely rare, there being probably fifty cases of the latter to one of the former. The cause of this remarkable difference is to be found in the exposed situation of the bone, and the great shortness and strength of its ligaments, which render it much more liable to yield in its continuity than at its articulations with the sternum and scapula. The displacement may occur at either joint, and several instances have been recorded where both were simultaneously affected.

1. The *sternal extremity* of the clavicle may be dislocated forwards, backwards, and upwards, the relative frequency of the accident being in the order here stated. Luxation downwards is rendered impossible on account of the resistance offered by the cartilage of the first rib.

Dislocation *forwards* is generally produced by injury inflicted upon the top of the shoulder, or by falls upon the elbow when the arm is separated from the trunk. The clavicle, being thus impelled violently forwards and inwards, completely ruptures the sterno-clavicular ligaments, and presents itself, along with the interarticular cartilage, in front of the upper part of the sternum. The sterno-cleido-mastoid muscle is pushed down, and some of its inner fibres are occasionally lacerated, particularly when they take their origin unusually near the joint.

The *signs* denotive of the accident are, a hard, circumscribed, incompressible tumor at the upper and anterior part of the sternum, a vacuity at the natural situation of the joint, unusual prominence of the inner portion of the sterno-cleido-mastoid muscle, depression of the shoulder, and inclination of the head towards the affected side. But the most reliable evidence of the nature of the case is derived from tracing the outline of the bone with the finger of one hand, while the shoulder is moved by grasping the elbow with the other, and by recollecting that in dislocation the bone retains its normal length, while in fracture it is materially shortened. The head of the clavicle overlaps the sternum, and is always, as in fig. 13, directed downwards, so as to enable the examiner readily to distinguish the articular surface from which it has been removed.

Fig. 13.



Dislocation of the sternal end of the clavicle.

The *reduction* of this dislocation is effected easily enough, but unfortunately it is retained with so much difficulty that, despite the best directed efforts of the surgeon, hardly an instance recovers without some degree of deformity. Many years ago I had a case of this kind under my charge, which, notwithstanding the most vigilant care and attention, was as bad, as it respected the cure, at the end of three months, as it was on the day it happened. Since then I have met with several similar examples. The articular cavity of the sternum is so shallow, and the ligaments unite with so much difficulty, that it is almost impossible to keep the parts in apposition sufficiently well or long to obtain complete consolidation. Fortunately, however, this occurrence does not materially affect the movements of the shoulder, for experience has shown that these are very soon entirely re-established. It is a matter, therefore, simply of deformity, not of utility.

To reduce this luxation, one hand should be placed, shut, in the axilla, while the other grasps the elbow, which is then to be raised in order to push up the humerus, and thus convert it into a lever, acting directly upon the clavicle and scapula. The shoulder is next carried upwards, outwards, and backwards, in a direction opposite to that of its displacement, and the forearm brought forwards across the chest, so that the thumb and fingers shall rest upon the sound collar-bone. By this manœuvre the articular surfaces generally resume their natural relations, but, should they not, the reduction is to be promoted by pressing the luxated head of the clavicle backwards and slightly upwards. A wedge-shaped pad, with the thick end upwards, being placed in the axilla, the limb is firmly secured to the side and front of the chest by the ordinary fracture apparatus, or, what is better, the adhesive-strip dressing, a stout, square compress being applied directly over the sterno-clavicular articulation. The dressing must be frequently inspected with a view to its readjustment, and be worn, with great constancy and regularity, for at least three months.

Dislocation *backwards* is generally produced in an indirect manner by injury applied to the shoulder impelling the scapula and the outer extremity of the clavicle forwards. It may also be caused by a severe blow upon the inner end of the bone, by the body being crushed between two resisting objects, and by violent traction upon the upper extremity when the trunk is firmly fixed and inclined backwards. The distinctive sign is that the head of the clavicle is forced backwards, and that it can be felt behind the summit of the sternum, sometimes below, at other times above, the level of that bone. A vacuity exists at the natural situation of the joint, the shoulder is directed somewhat forwards, the arm hangs uselessly by the side, and there is generally considerable dyspnœa, with cerebral congestion, and difficulty of deglutition, from the pressure of the luxated bone upon the trachea, cervical vessels, and œsophagus. The ligaments are completely ruptured, and the sterno-cleido-mastoid muscle is partially separated from its sternal attachments.

The *reduction* is effected upon the same principles as in the dislocation forwards, the fist being placed in the axilla and used as a fulcrum, while the shoulder is pushed upwards, outwards, and well backwards, and retained in this position by an appropriate apparatus, of which a figure-of-8 bandage with a long, thick, square compress between the shoulders is one of the best. Whatever means, however, be employed, it will be found extremely difficult to keep the articular surfaces in apposition and to prevent deformity. When the reduction is unusually obstinate, as it sometimes is when the head of the bone is firmly wedged in behind the sternum, the knee should be placed between the shoulders, the affected one of which should then be drawn forcibly backwards and outwards, the arm being at the same time extended nearly at a right angle with the trunk.

This variety of dislocation is sometimes produced by deformity of the spine, allowing the shoulder to sink gradually forwards so as to push the head of the bone from the sternum. In a case of this kind which happened to Mr. Davie, of England, the clavicle compressed the œsophagus so severely as to cause great difficulty in swallowing, and danger to life by starvation. As reduction was impracticable, the trouble was remedied by sawing off the sternal end of the bone about one inch from the articulation. The patient speedily recovered, and lived six years after the operation.

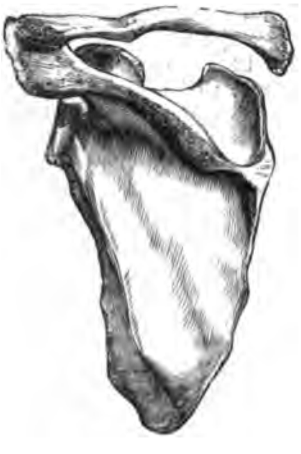
Luxation *upwards* is extremely rare; so much so, indeed, that many of the best surgeons formerly doubted the possibility of its occurrence. The cases, however, that have been reported within the last twenty years by Macfarlane, Baraduc, Malgaigne, and others fully establish its claims to the distinction of a new species. The accident generally results from violence inflicted upon the shoulder, as a blow or fall, driving the scapula downwards and inwards towards the chest, thus separating the bone from its connections, and forcing it upwards above the fourchette of the sternum. The symptoms are usually very characteristic. The bony tumor can be distinctly felt and seen in front of the trachea, where it is easily impressed by moving the corresponding arm; the shoulder, sunk forwards and downwards, approaches nearer to the median line than naturally; there is a remarkable interval between the clavicle and the cartilage of the first rib, amounting to from six to twelve lines; the sterno-cleido-mastoid muscle is put upon the stretch; and there is a vacuity at the joint, as in the other forms of the accident. The reduction is very easily effected, simply by lifting the shoulder thoroughly away from the chest, at the same time that it is slightly elevated and inclined backwards, and pressure made directly upon the luxated head. Retention is to be attempted upon the same principles as in the other sterno-clavicular luxations; a pad being placed in the axilla, and the elbow and forearm being well supported by adhesive strips and bandages. The union is generally imperfect, but this does not materially weaken the functions of the limb.

2. The *scapulo-clavicular* articulation is effected by the acromion process of the scapula and the outer extremity of the clavicle, by a species of arthrodia, the concave surface of the former being closely adapted to the convexity of the latter, and the union established by strong ligamentous bands. Admitting of hardly any motion, it can be dislocated only by external violence applied either directly to one or the other of the two bones, or indirectly through the arm and sternum. The accident is usually attended with severe contusion of the soft parts, and is seldom so thoroughly repaired as not to be followed by some degree of deformity, although the recovery of the motions of the limb is eventually sufficiently perfect for all useful purposes.

The scapular end of the clavicle may be thrown from its natural position in three different directions; upwards, above the acromion process, downwards and backwards, beneath this prominence, and downwards and forwards, under the coracoid process. Of these luxations, the first is by far the most frequent; both the others are extremely rare.

In the dislocation *upwards*, the end of the clavicle, breaking away from its articular connections, is thrown up by the action of the trapezius muscle, or by the impelling force, so as to overlap the acromion process, as in fig. 14, and form a small, hard, round tumor immediately beneath the skin, which disappears upon raising the arm, but is reproduced the moment we let go our hold. The head is inclined towards the injured side, the limb hangs closely along the trunk, the shoulder looks as if it were somewhat flattened, and the patient is unable, without great pain and difficulty, to carry his hand to his mouth; in a word, the whole attitude of the body is nearly the same as in fracture of the clavicle. The accident is usually caused by a blow upon the shoulder, and the circumstance of the trunk being strongly impelled forwards promotes the luxation by increasing the strain. It may also be occasioned by a fall upon the elbow, and by a kick upon the acromion process. However induced, there is necessarily, in the complete form of the lesion, a rupture not only of the acromio-clavicular ligaments, but also of the ligaments connecting the clavicle with the coracoid process. In the incomplete luxation the latter always escape.

Fig. 14.



Dislocation of the scapular end of the clavicle.

The clavicle readily resumes it natural position by drawing the shoulders upwards and backwards, while the knee is interposed between them behind, as the patient sits upon a chair. To maintain it in this situation, the same apparatus and dressings must be used as in fracture of this bone, and in the sterno-clavicular luxations, already described. A thick pad, with the base directed upwards, is placed in the axilla, and the arm and forearm must be well secured to the chest. Direct pressure by means of a stout compress and piece of sheet lead should be made upon the acromio-clavicular junction. Despite, however, all the precaution, care, and skill of the surgeon, he will seldom be able to procure a good cure. I have seen cases of this description treated for months with the most determined effort to succeed, and yet at the end of this time it was impossible for the patient to move his arm without causing a relapse.

Dislocation *downwards*, appropriately named *infra-acromial*, is exceedingly uncommon, only a few cases of it having been reported. The fact is, although it was described by J. L. Petit, who believed it was more frequent than dislocation upwards, it has been almost entirely ignored by modern systematic writers. It has been alleged that the accident cannot happen without previous fracture of the coracoid process, a conjecture which has been satisfactorily disproved by experiments made upon the dead subject.

The accident, in the few cases that have been carefully studied, has been the result of violence upon the shoulder, as a heavy blow, or a kick from a horse, and it can hardly be imagined that it could be produced in any other manner. It is probably, in every instance, attended with a rupture of the coraco-clavicular ligaments. The characteristic sign is the situation of the end of the clavicle beneath the acromion process, which is at the same time remarkably prominent, and somewhat nearer to the sternum than in the natural state. The shoulder is flattened, and the arm, applied close to the side, is incapable of voluntary motion. Where the evidence is so distinct, error of diagnosis must be impossible. Should any doubt, however, arise upon the subject, it may easily be dispelled by tracing the outline of the two bones as far forwards as their articulation; the finger, as it approaches this point, will at once detect the extraordinary prominence of the one, and the marked depression of the other, and so reveal the true nature of the accident.

The *reduction* is accomplished by pulling the shoulder outwards and backwards, while the knee rests against the dorsal portion of the spine, and the patient's elbow is carried across the chest, to afford greater relaxation to the muscles, and convert the humerus into a lever for acting more efficiently upon the acromion process. Retention is effected in the usual manner, with the additional precaution of preventing all motion of the inferior extremity of the scapula. A perfect cure may be expected in from five to eight weeks, both as it respects the absence of deformity and the recovery of the functions of the limb.

Dislocation forwards and downwards, beneath the coracoid process—the *infra-coracoid* form of the accident—has only recently taken its position in surgical nomenclature. The lesion, like the preceding, is infrequent. Malgaigne states that he is acquainted only with six cases, of which not less than five are said to have occurred in the practice of Dr. Godemer, of Mayenne. If this be true, the luxation must be much more common than is supposed, which, however, I doubt. A fall upon the anterior surface of the shoulder appears to be the usual cause of the accident.

The *symptoms* are unmistakable. Besides the contusion and discoloration common to all these luxations, the acromion and coracoid processes are unusually prominent; the top of the scapula is strongly inclined downwards and forwards, and there is a marked depression in the natural situation of the clavicle, which, upon being traced with the finger, is found to be directed outwards and downwards, its extremity being actually lodged in the axilla. The arm can be moved in every direction, except upwards and inwards.

The *reduction* is easily effected. The chest being firmly fixed with a strong napkin, an assistant seizes the arm, and, converting it into a lever, uses it for forcibly pushing the scapula outwards and backwards, while the surgeon himself, grasping the clavicle, disengages it from its position beneath the coracoid process, and restores it to its natural situation. The retention is maintained by the usual apparatus. The cure is generally satisfactory.

Seeing how difficult it is to keep these various dislocations of the clavicle reduced, I should not hesitate, if an opportunity arose, to fasten the ends of the bones with a silver wire, inserted subcutaneously, and retained until union occurs. The operation could be easily executed, and would not be likely to cause any bad effects.

Double dislocation of this bone has been observed, so far as I know, only in two instances. One of these has been reported by Porral, and is said to have occurred under the care of Gerdy, in the St. Louis Hospital, at Paris. The accident was caused by a fall from a third-story window, upon the upper and back part of the shoulder. The symptoms were well-marked, the acromial end of the bone being luxated backwards and upwards, the sternal upwards and forwards. The treatment was by Desault's well-known, but now obsolete, apparatus, aided by large graduated compresses over the affected joints. Under this dressing, the outer extremity of the clavicle soon became firmly united, but the other continued obstinately displaced.

The other case was reported by Morel-Lavellée, in 1859. His patient was forty years of age, and the dislocation was caused by the shoulder being compressed between a pile of wood and the wheel of a carriage, the sternal extremity of the bone being thrown forwards, and the scapular upwards towards the neck. The supra-clavicular and subclavicular hollows were entirely effaced. The inner displacement was easily reducible, but no effort that could be used made any impression upon the outer.

The clavicle is occasionally dislocated at one or both extremities, as a *congenital* vice. I observed, some years ago, a well-marked example of this accident at the sterno-clavicular articulation, in an infant three months old, otherwise perfectly healthy and well-formed. The end of the clavicle projected upwards and forwards, in a striking degree; and, although reduction could readily be effected, nothing that I could employ could keep the parts in place.

DISLOCATIONS OF THE STERNUM.

Dislocations of the sternum are extremely rare, and must necessarily be the result of extraordinary violence. Hence, they are nearly always complicated with serious lesion of the soft parts and fracture of the ribs, spine, clavicle, or even of the sternum itself. The accident has hitherto been noticed only between the first and second pieces, the latter of which was always thrown in front of the other, no instance having yet been witnessed in which the displacement occurred in the opposite direction. In ten cases collected by Malgaigne the dislocation was occasioned either by direct violence, as a blow or severe pressure, or by a fall from a considerable height, in which the spine was bent forcibly forwards. Of these cases, five terminated fatally from other injuries. When the luxation is simple, no serious consequences are to be apprehended. The reduction is not always practicable. When the overlapping is considerable, the best plan is to extend the patient's body over a large bolster, and then push the second piece forcibly downwards and backwards.

A few cases have been recorded of dislocation of the ensiform cartilage from blows or falls upon the epigastrium. The accident is generally attended with pain in the stomach, dyspnœa, and obstinate vomiting. Reduction is effected by extension and pressure. In one instance an incision was made on one side of the depressed cartilage, through the peritoneum, and restoration accomplished by means of an elevator.

A case of congenital dislocation of the ensiform cartilage, caused by a fall during the fifth month of pregnancy, has been reported by Seger.

DISLOCATIONS OF THE SCAPULA.

Displacement of the scapula, independently of that which occurs at the acromioclavicular articulation, may depend upon different causes. In general, it is produced by a relaxation of the fibres of the broad dorsal muscle, as it passes over the inferior angle of this bone. So far as my observation extends, the affection is most common in young girls, of a feeble, delicate organization, soon after the age of puberty. It is also occasionally met with in boys, in consequence of the violent, habitual exertion incident to certain avocations. When the affection exists in its worst form, the relaxation of the muscle may be so great as to permit the lower angle of the scapula to project in a very unseemly manner. In some instances both sides suffer simultaneously, and then the deformity is, of course, materially increased. Aching pain and weakness of the corresponding limb are ordinary concomitants of the complaint.

Occasionally the broad dorsal muscle, in consequence of a fall or blow, is forcibly wrenched from its connections with the scapula, and slips down beneath the inferior angle of the bone, which then forms a remarkable prominence immediately under the skin. The accident is easily recognized by the history of the case, by the contused condition of the soft parts, and by the loss of function in the superior extremity.

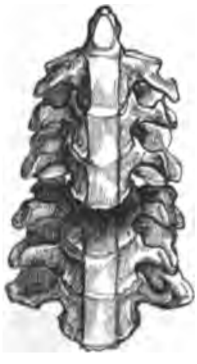
When the displacement is caused by a weak and relaxed condition of the dorsal muscle, the most reliable remedies will be chalybeate tonics, friction with stimulating lotions, electricity, the cold shower-bath, and exercise in the open air. The arm should be supported in a sling, close to the side of the body, and the inferior angle of the scapula should be kept in place by means of a suitable pad secured round the trunk. In the traumatic form of the affection leeches and saturnine applications will be required, and the limb should be well raised and carried backwards, so as to afford complete relaxation to the injured muscle. Re-attachment of the torn fibres should be aimed at, and the scapula should therefore be maintained at rest for a long time, otherwise there will be a certainty of re-displacement. This occurrence, however, is of less importance than is generally supposed, as in time the parts, in great measure, if not completely, regain their original power.

Serious malposition of the scapula sometimes arises from paralysis of the rhomboid muscles, chiefly in young anemic persons, of a scrofulous habit of body. Sedentary occupation and constrained posture powerfully predispose to its occurrence. Great deformity is apt to attend, the posterior border and inferior angle of the scapula being widely separated from the trunk, and standing out in bold relief. The treatment should consist of tonics and of various local means calculated to restore the functions of the affected muscles.

DISLOCATIONS OF THE SPINE.

The vertebræ are so firmly connected to each other, and, excepting those of the neck, admit of such limited motion, that any injury directed against them is much more liable to break than to luxate them. Even in the cervical region, where the mobility is much greater than anywhere else among these bones, the accident is exceedingly uncommon, and it is fortunate that it is so, since it is almost always fatal, owing to the violence inflicted upon the spinal cord, as shown in figs. 15 and 16, causing death not infrequently in an instant, or, at farthest,

Fig. 15.



Dislocation of the spine between the fourth and fifth cervical vertebræ. The cord was torn, the paralysis being complete, and death occurred in a few days.

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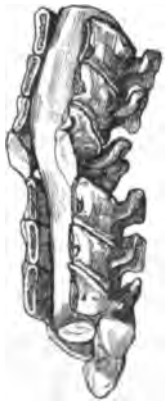
Fig. 16.



The same, seen laterally.

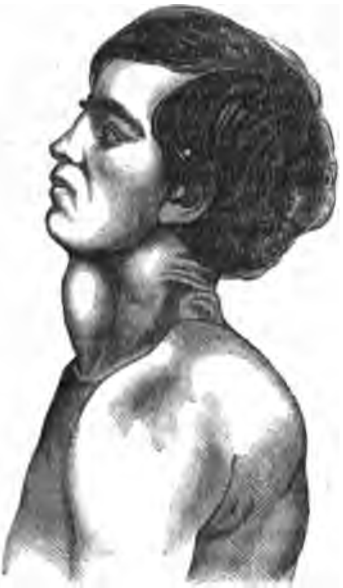
within the first few days. When the patient survives the more immediate effects of the dislocation, he is very apt to perish from inflammation of the spinal cord and its envelops, at a period varying from a few weeks to several months. Hence, whether the accident be considered with reference to its primary or secondary effects, our prognosis must be equally guarded, few persons, under any circumstances, recovering. In a dislocation of the sixth and seventh vertebræ, under the charge of Dr. Willard Parker and myself, many years ago, death occurred in less than forty hours. The patient was a young man, a circus-rider, who met with the accident while he was engaged in tumbling in the pit; it was instantly followed by paralysis of all the extremities, and he gradually fell into a state of unconsciousness, which lasted until he expired. The neck was stiff and painful, but there was no sign of displacement. On dissection, the articulating processes and bodies of the sixth and seventh cervical vertebræ were found to be completely detached from each other on the right side, but on the left the processes were still slightly adherent, while the connection between the bodies of the bones was perfect, although in a high state of tension. The two contiguous spinous processes were completely severed. There was no fracture. The spinal cord was sensibly compressed by the partial rotation of the seventh vertebra, and there was a slight effusion of blood in the spinal canal at the seat of the injury.

The above case is a good type of the *effects* which usually follow dislocations of the vertebræ. When the lesion occurs above the origin of the phrenic nerve, death is often instantaneous from stoppage of the respiration; if it be seated farther down, the patient may live for some time, and even eventually recover, although such a contingency is an extremely remote one. The diagnosis is generally very obscure, it being usually impossible to determine whether the accident is a dislocation or fracture, or a combination of both, while the treatment must, of necessity, be altogether empirical. The principal symptoms are paralysis of the extremities, tympanitis, obstinate constipation, and retention of urine, which soon becomes loaded with phosphates, causing inflammation and ulceration of the bladder. If the patient survives any length of time, severe bedsores are apt to form upon the nates and other parts of the body, thus greatly increasing his suffering.

The most common *cause* of dislocation of the spine is external injury, as a blow, fall, or sudden wrench. An instance has been reported by La Salle in which the fifth and sixth cervical vertebræ were severed by a violent muscular effort, the patient, a maniac, dying in thirty-six hours. Occasionally the displacement is the result of ulceration of the vertebræ or the partial destruction of the ligaments.

As it respects the *reduction* of these dislocations, it is impossible to prescribe any regular or methodical course of procedure. Most practitioners, dreading interference on account of the danger of sudden compression of the spinal cord, and the consequent destruction of the patient, are in favor of allowing the parts to take care of themselves, hoping, with judicious management, for gradual recovery. Such a plan, it seems to me, is both wise and proper, at least in most cases, especially those in which it is impossible to determine the diagnosis, or where the symptoms, although well marked, are not at all urgent, the patient having a tolerably good use of every part of the body save the one immediately implicated in the mischief. Under such circumstances, time and a "masterly inactivity" will often accomplish more than all the interference of the best surgeons. But there are exceptions to every rule, and, while I would recommend that most cases of this kind should be let alone, I would strongly advise an opposite course where, the symptoms being well marked, and the danger urgent, there is reason to believe that the patient will, if not relieved, speedily perish. In such an event any attempt to save him, however desperate, would be perfectly justifiable and proper. If we succeed, we obtain a victory; if we fail, we can but hasten an occurrence otherwise inevitable. A number of instances are upon record where the reduction was performed successfully. Dr. James R. Wood, not long ago, safely restored, by manipulation, a partial dislocation of the cervical vertebræ in a child; and Dr. Ayres, of Brooklyn, more recently, happily succeeded in a case of complete luxation of these bones ten days after the accident. The patient, a tall, muscular man, aged thirty, had been violently struck on the back of the neck, the anterior portion of which was found to be remarkably convex from the blow, bulging forwards, and lifting up the larynx, as seen in fig. 17. The head, as the man sat in his chair, was thrown backwards and permanently fixed, the face being turned upwards. The posterior part of the neck exhibited a sharp, sudden angle at the junction of the fifth and sixth cervical vertebræ, around which the integument lay in folds. It was difficult to reach the bottom of this angle, even with strong pressure of the fingers, and of course the regular line formed by the projecting spinous processes was abruptly lost. The patient complained of intense pain at this part; he swallowed with much difficulty, and the breathing was obstructed and somewhat labored; but there was not the slightest paralysis or diminution of sensation. The reduction was effected by means of the hands of the surgeon and of two assistants, applied to the chin and occiput, and then used to draw the head, at first, directly backwards, then upwards, and finally forwards, counter-extension being made with two folded sheets stretched obliquely across the shoulders. The system was completely relaxed by chloroform, and the bones were distinctly felt slipping into their natural situation. No unpleasant symptoms followed, and, at the end of a week, the man had the complete use of his head and neck.

Fig. 17.



Bilateral dislocation of the fifth cervical vertebra.

A few cases of traumatic luxation of the *occipito-atloid* articulation have been reported, but, so far as I know, all, except one, and that was only a partial displacement, promptly proved fatal. The accident, until recently, was regarded by most writers as impossible, on account of the firm connections and restricted motions between the two bones.

A slow species of displacement occasionally occurs here in children and youths, from scrofulous disease of the articular surfaces and body of the atlas, or of this bone and some of the other vertebræ. Several examples of it have come under my personal observation, and the subject has been well discussed by Schupke and other German writers. The severe local suffering which it produces is to be allayed by rest and recumbency, leeches, blisters, and issues, especially those made with the actual cautery, while the constitution is to be improved by tonics and alterants, as quinine and iron, and the different preparations of iodine. When all disease is arrested, the patient may exercise in the open air, the neck and head being well supported by appropriate apparatus.

The *atlo-axoid* articulation, enjoying a much wider range of motion than the preceding, is more liable to luxation by external violence, the most common causes being blows upon the back part of the head, forcible torsion of the neck, tumbling, and standing on the head, eventuating in rupture of the ligament of the odontoid process, and the projection of this process against the spinal cord, inducing fatal compression. Lifting children up by the occiput and chin, in play, is capable of producing this accident, as is proved by the memorable case related by J. L. Petit, of a little boy, who, being thus raised up in the air, struggled so violently as to dislocate his neck, dying on the spot. The nature of the lesion may be suspected when, in consequence of a sudden twist, blow, or wrench, the head is turned to one side, and cannot be brought back to its natural position, the cleido-mastoid muscle being relaxed, and the part exquisitely painful. Un-

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consciousness usually succeeds the occurrence, and the patient, if not promptly relieved, soon expires. When the symptoms are urgent, an immediate attempt should be made to reduce the dislocation by inclining the head towards the side to which it is directed in order to disengage the articular processes, a most hazardous step of the operation, and one which may instantly cause death by compression of the spinal cord. The processes being liberated, the head and neck are next brought to their natural position by rotating them gently in a direction contrary to that in which the luxation occurred.

Finally, a species of *subluxation* occasionally occurs in the spine. It consists, as the name implies, in a partial displacement of the vertebræ, and may take place in any portion of the column, although it is probably most frequent in the dorsal region. It may be caused by injury applied directly to the part, or, indirectly, through a fall upon the buttocks, in which these structures and the body are forcibly pushed towards each other, the violence of the shock being concentrated upon the ligaments, which, being thus forcibly rent asunder, leave a corresponding gap between the contiguous spinous processes. The accident is generally attended with severe concussion, and, occasionally, even with compression, of the spinal cord, thereby seriously endangering the patient's life. Sometimes there is partial paralysis, with retention of urine, and other unpleasant symptoms.

The treatment is by recumbency upon a soft hair mattress, with leeches and medicated lotions to the seat of the injury, and such internal remedies as the particular exigencies of the case may seem to demand.

DISLOCATIONS OF THE RIBS AND COSTAL CARTILAGES.

Dislocations of the costo-vertebral articulations from external injury must be extremely rare, if, indeed, they are not altogether impossible. That this is true any one may satisfy himself by inspecting the mode in which the ribs are connected to the vertebræ; the ligaments are both numerous and powerful, and, besides, each joint is protected by a great thickness of muscle, so that these bones, instead of yielding at their junctions, will be much more apt to give way in their continuity. The possibility, however, of the accident was not only admitted, but strenuously maintained, by many of the older surgeons, especially by Paré, Barbette, Platner, and Heister, in whose works may even be found an account of what they regarded as varieties of the lesion. But modern experience is entirely opposed to such a conclusion; in truth, there are altogether not more perhaps than half-a-dozen well authenticated cases of dislocation of the costo-vertebral articulations upon record, and in nearly every one of these the injury was associated with fracture of the ribs, or of the ribs and spine; all proved fatal, and in none was it possible to make a satisfactory diagnosis during life. Such an accident must, therefore, be entirely beyond the resources of surgical art; even if it were possible to detect the nature of the affection, still it would be impracticable to remedy it, except upon general principles, any direct interference being out of the question.

Dislocation of the ribs from their cartilages, and of the latter from each other and from the sternum, is also a rare occurrence, though not as much so as displacement of the costo-vertebral articulations. I have myself seen several cases of the kind, one of which I attended, along with Dr. J. R. Pirtle, the patient being a man, aged sixty, who fell from a scaffold, a distance of ten feet, upon the stone steps below, his left shoulder and chest receiving the blow. Immediately after the accident there was violent dyspnœa, and the patient heard and felt, at every inspiration, something snap and jerk in his side, similar to the noise caused by pulling a finger-joint. Upon examination, this was found to proceed from a dislocation of the cartilages of the last three ribs from the sternum, playing to and fro during the movements of the chest. A fracture also existed in the left clavicle. In another instance the third and fourth ribs on the right side were severed from their cartilages. The remarkable case related by Charles Bell, in his Surgical Observations, in which all the ribs were dislocated from their cartilages by the thorax being violently compressed between a wall and the beam of a mill, is familiar to every surgeon. Occasionally the costal cartilages are separated from each other.

Whatever form these costal dislocations may assume, their existence necessarily implies the infliction of severe injury, which cannot fail to tell badly upon the soft parts, both externally and within the chest, and to be followed, when it is not immediately fatal, by violent inflammation. Hence, besides the attention required by the local mischief, great care is demanded on account of the state of the system; in the first instance, to bring about reaction, and, secondly, to moderate the resulting excitement by appropriate antiphlogistics. The topical treatment is by bandage and compress, as in fracture of the ribs, the patient being compelled to breathe chiefly by the aid of the diaphragm.

DISLOCATIONS OF THE PELVIS.

Notwithstanding the great extent of the *sacro-iliac* surfaces, and the vast strength of the ligaments by which they are connected together, observation has demonstrated that they may occasionally be displaced along with the pubic symphysis, by external violence. Dr. Thomas Harris, of this city, many years ago, met with a case of dislocation of these bones in a woman, aged thirty-five, from a blow upon the sacrum inflicted by the husband's fist. In general, however, a much greater degree of force is necessary to produce such an accident; hence there must almost always be more or less contusion of the soft parts, both externally and internally, extensive ecchymosis, concussion of the spinal cord, injury of the sacral nerves, and fracture of some of the pelvic bones, thus seriously, if not fatally, complicating the case. Even when the patient survives the immediate shock of the accident, he is very apt to perish from the subsequent inflammatory and suppurative irritation, perhaps weeks after the primary effects have passed off.

Violent kicks or blows, and compression of the body between two hard and resisting objects, as a wall and a carriage, are the usual causes of this dislocation. The displaced bone is thrown backwards and upwards, forming a distinct prominence beneath the skin, easily perceptible by sight and touch, and attended with marked crepitation. The limb of the affected side is shortened and powerless, the crest of the ilium is raised beyond the natural level, the fold of the nates is flattened, the tuberosity of the ischium is higher than that on the sound side, and the ramus of the pubic bone lies somewhat posterior to the plane of its fellow. The parts are contused and exquisitely painful, and the patient is unable to lie upon his back, or to void his urine.

In the *treatment* of this luxation, the most important object, that upon which the safety of the patient mainly depends, is to prevent the ill effects of inflammation. To accomplish this, he must be kept perfectly at rest, and be subjected to the most strict antiphlogistic course, of which leeching, anodyne fomentations, and blisters form a most valuable constituent. When the inflammation has been well reduced, the parts should be covered with an ammoniac and mercurial plaster. The reduction, which is easily effected by pressure, is maintained by a compress and broad bandage, secured, if necessary, by thigh and shoulder straps. Great attention must be paid to cleanliness, as defecation will be both painful and inconvenient, and the urine must be regularly drawn off with the catheter. In a case mentioned by Hoin, the articular surfaces refused to come together until after the patient had begun to walk about, when the weight of the limb drew them gradually in place.

The *pubic symphysis* is sometimes wrenched open by external violence, as I have witnessed in two cases in persons whose bodies had been crushed between a railroad car and the edge of the floor of the depot. The accident is generally fatal, not so much on account of the injury done to the joint and bone as of the violence sustained by the contents of the pelvic cavity. The treatment must be conducted upon the same principles as in dislocation of the sacro-iliac symphysis.

A separation of this joint occasionally occurs during utero-gestation, from softening of its fibro-cartilage, allowing the two bones to ride slightly upon each other. A case of this kind came under my observation not long ago. The woman was in her fifth pregnancy, and the dislocation, beginning about a month before her confinement, was so great that she could not walk, or turn in bed, without some distress. The parts were exquisitely tender on pressure, and upwards of five weeks elapsed after parturition before they regained their healthy condition. Rest, recumbency, and leeches constitute the proper treatment, aided, when the patient is able to move about, by a belt with a pad upon the pubes.

The *coccyx* may be dislocated from the sacrum by external violence, as a fall, or kick, or by the pressure of the child's head in difficult parturition. The bone is usually thrown forwards or backwards. In a case recently reported by Dr. Roeser, it was displaced laterally, being torn away from the sacrum, and carried over towards the descending branch of the left ischium, where it formed a small but distinct tumor. The signs of the accident are preternatural fixedness of the coccyx, with considerable shortening, difficulty in voiding the feces, tenesmus, and retention of urine. Reduction is effected by introducing the index and middle fingers of one hand into the rectum, while by the assistance of the fingers of the other, applied externally, the bone is pushed into its proper position. Rest, fomentations, and leeches will be required during the after-treatment. The bowels should not be moved for a number of days, and then only by means of saline cathartics and enemata, as all motion and straining would interfere with the reparative process, and might even reproduce displacement.

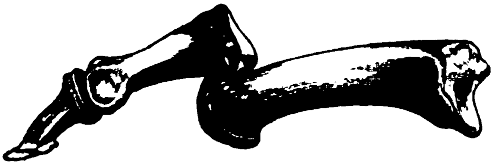
2. SUPERIOR EXTREMITY.

DISLOCATIONS OF THE HAND.

Dislocations of the *thumb*, especially of its metacarpo-phalangeal joint, are, in many respects, so peculiar as to require separate consideration. Displacement of the phalanges backwards is by far the most common, the disposition of the articular surfaces, and the ligaments by which they are connected together, rendering luxation forwards or laterally extremely difficult.

In luxation of the metacarpo-phalangeal joint, the head of the first phalanx is thrown backwards, as seen in fig. 18, upon the dorsal surface of the metacarpal bone, generally by violence applied to the palmar surface of the thumb, while the joint is immoderately extended. The metacarpal bone being thus impelled by the weight of the body, and the proximal phalanx by the object it strikes against, causes the ligaments to give way, and the articular extremities to glide past each other. It has been asserted that, when there is inordinate relaxation of the ligaments, mere muscular action is capable of producing the displacement, but the possibility of such an occurrence, especially in its complete form, is very questionable.

Fig. 18.



Dislocation of the first phalanx of the thumb, backwards, on the dorsum of the metacarpus.

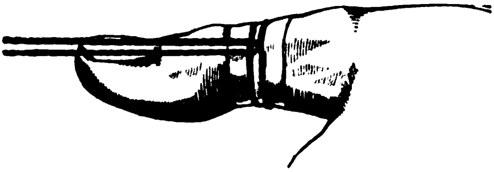
The dislocation is attended with great deformity, which is so peculiar that it may be regarded as characteristic. A large tumor, hard and circumscribed, and formed by the head of the first phalanx, exists upon the back of the joint, while another, equally hard, but not quite so distinct, is perceptible on the palmar aspect of the thumb, representing the distal extremity of the metacarpal bone; the thumb is sensibly shortened, and can generally neither be bent nor extended, its last phalanx, however, being usually flexed in consequence of the excessive tension of the tendon of the long flexor muscle. In most cases, the head of the first phalanx will be found to rest upon the posterior and inner part of the metacarpal bone, and not, as is commonly supposed, altogether upon its dorsal surface, and it is owing to this fact that the thumb looks as if it were rotated a good deal inwards. The shortening of the member often amounts fully to one inch, thus giving it a stumpy, characteristic appearance.

If a *dissection* be made of the affected parts, the ligaments will be found to be extensively ruptured, particularly the anterior; the extensor tendons are pushed backwards, and strongly stretched; and the external head of the short flexor muscle is torn in two, allowing the end of the metacarpal bone to pass completely through its fibres. The anterior ligament remains attached to the sesamoid bones and the first phalanx, the latter of which, as it is thrust backwards during the accident, carries both along with it, so as to deposit them, as it were, between its anterior surface and the contiguous surface of the metacarpal bone. In this way a partition is formed by these parts between the two bones, extending back some distance, and constituting, as Mr. Lawrie justly remarks, a serious mechanical obstacle to replacement.

The *reduction*, as just stated, is generally difficult, and the means formerly employed to effect it were often so severe as to inflict the most dreadful injury, sometimes followed by extensive erysipelas and even mortification. Instances, in fact, were not wanting, though fortunately they were few, of the thumb being dragged off during violent and long-continued efforts at restoration. In many cases, again, all efforts of the kind proved unavailing, and the parts were obliged to be left in the condition into which the accident had thrown them. Desault, in order to accomplish his purpose, in difficult cases, suggested the idea of making an incision behind the extremity of the dislocated bone, and raising it out of its position by means of a suitable lever; and Evans went so far as to propose its removal altogether by excision. Charles Bell, on the other hand, attempted to remedy the evil by the subcutaneous section of one of the lateral ligaments, an operation which has frequently been performed successfully both in this country and in Europe. Sir Astley Cooper advises, after a fair trial of the ordinary means, an abandonment of the case, under the idea that the patient will eventually have a useful thumb without reduction. I allude to these views simply because they serve to show the great difficulty which so often attends this dislocation, and the harsh expedients that have been suggested for overcoming it.

The most common method of effecting replacement is that by extension and counter-extension, employed upon the same principles as those which regulate their application in dislocations of other joints. It has always answered admirably in the few cases of the accident that I have had to treat. The extension should be made by means of the clove-hitch, seen in fig. 19, secured over a wet cloth, or piece of buckskin, to protect the soft parts, and the counter-extension with a stout silk handkerchief, the fold resting in the palm of the hand, while the ends, crossed behind the wrist, and brought round the front of the forearm, are held by an assistant. In this way the two forces may be applied with great effect, in a line with each other, and without the risk of unduly exciting the muscles concerned in the displacement. After they have been in operation for a short time, the thumb should be inclined inwards, in a semicircular direction,

Fig. 19.



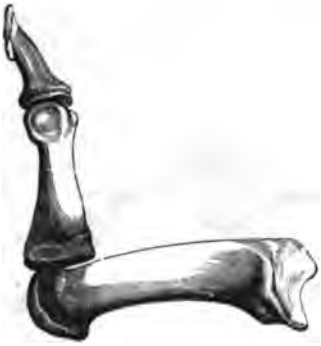
Clove hitch-knot.

towards the ulnar margin of the hand, at the same time that the dislocated head is urged forwards and downwards by the surgeon's own thumb. Powerful extension may also be made by means of Charrière's forceps and Dr. Levis's apparatus, to be presently described.

Occasionally the reduction may readily be effected by abduction and rotation of the thumb, the extension being kept up in the usual manner. When the parts refuse to yield, despite our efforts, the best plan will be to resort to the subcutaneous division of the tendon of the long flexor muscle, which is frequently, if not generally, the chief obstacle to replacement.

Although the method now described will, I am satisfied, generally suffice for the reduction, yet, if I should ever again be called to a case of the kind, I should at once adopt the excellent plan first practised in 1826 by Professor Crosby, of New Hampshire, and since recommended by Gerdy, of Paris. It simply consists, as the adjoining cut, fig. 20, clearly exhibits, in pushing the phalanx back, until it stands perpendicularly on the metacarpal bone, when, by strong pressure directed against its base, from behind forwards, it is readily carried by flexion into its natural position.

Fig. 20.

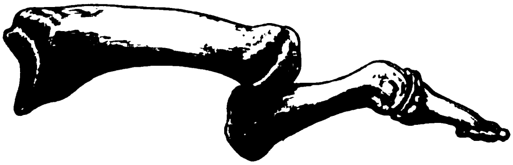


Dr. Crosby's mode of reduction.

The annexed sketch, fig. 21, exhibits a plan of the dislocation of the head of the phalanx of the thumb forwards towards the palm of the hand. As already stated, it is an occurrence of great rarity. The symptoms are characteristic.

Dislocation of the *trapezio-metacarpal* joint may occur in four different directions, the end of the metacarpal bone being thrown off from the articular surface backwards, inwards, forwards, or outwards; the first two forms of the accident, however, are by far the most common, as will be apparent from an examination of the structure of the articulation and the arrangement of the muscles stretched along its anterior and outer surface.

Fig. 21.



Forward dislocation of the thumb.

Luxation *backwards* is always occasioned by external injury, as a blow or fall upon the dorsum of the thumb or the extremity of its metacarpal bone, by which the latter is suddenly and violently turned towards the palm. The signs of the accident are characteristic. A hard prominence is seen and felt upon the back of the trapezium, or at the posterior and radial surface of the hand, formed by the displaced head of the bone, and the thumb is in a forced state of flexion, without the possibility of being extended. In order to effect reduction two assistants are required; one to fix the hand by grasping the wrist, and another to pull the thumb with a clove-hitch. When the parts are thus drawn in opposite directions, the surgeon pushes the head of the bone forwards and downwards towards the palm, into its natural position. For some days the hand should be supported upon a broad splint, and means employed to moderate inflammation.

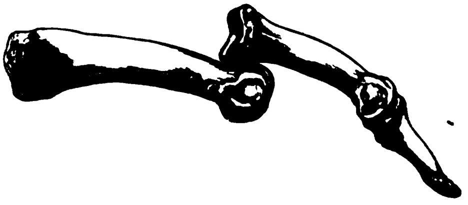
I have occasionally seen a partial dislocation of the metacarpal bone of the thumb backwards from inordinate relaxation of the ligaments. The occurrence is most common in weak, delicate women, and requires tonics, with the cold douche and a series of small blisters, for its relief.

In the luxation *inwards*, which is exceedingly infrequent, the metacarpal bone of the thumb is wedged in between the trapezium and the head of the metacarpal bone of the index-finger, so as to extend the thumb, and cause the trapezium to form a projection at the outer and back part of the palm. In the reduction the extension and counter-extension are conducted as in the preceding case, but they have to be kept up a longer time, and, as the head of the bone approaches the trapezium, the thumb is to be inclined towards the inner side of the hand, in order to relax the flexor muscles.

DISLOCATIONS OF THE FINGERS.

The phalangeal joints are susceptible of luxation backwards, fig. 22, an occurrence which can only be caused by severe force, and which is always so well characterized as to render any description of its signs unnecessary. The reduction is effected by extension and counter-extension, aided by pressure upon the head of the displaced bone. The accident is extremely rare. Not long ago, I had a compound dislocation of the last joint of the right middle finger, in a stout, healthy man, in consequence of a fall from a hay-loft, in which he struck the end of the finger violently against the ground. The distal phalanx lay upon the posterior surface of the middle one, a large wound existing in front. The reduction was easily effected, and the parts being well approximated by suture and collodion-plaster, I indulged the hope of a good cure. Presently, however, severe inflammation set in, terminating in necrosis of the two bones, and I was obliged to amputate the finger just behind the joint.

Fig. 22.

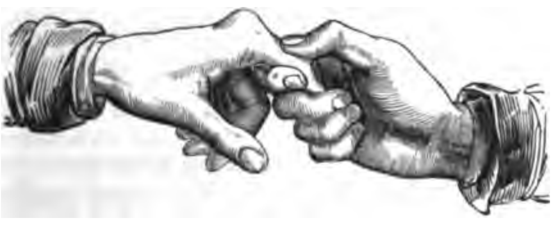


Dislocation of the finger.

Dislocation of the *metacarpo-phalangeal* joints is also very uncommon, although not so much so as of the joints of the fingers The phalanx is usually displaced backwards, its extremity resting upon the posterior surface of the metacarpal bone. Of the luxation forwards I have seen but one case, and that was of many years' standing; the finger was considerably shortened, and stood out in an extended position, flexion being impracticable.

Dislocation backwards is generally caused by severe blows upon the back of the hand, or the extremity of the finger, while it is immoderately bent. The case is recognized by the existence of a hard tumor in the natural site of the knuckle of the hand, fig. 23, and by the shortened and flexed condition of the finger, the extension of which is impracticable.

Fig. 23.



Dislocation of the finger at the metacarpo-phalangeal joint.

The *reduction* is generally not difficult. To effect it, extension is made upon the finger by means of a suitable lac, fastened with the sailor's noose, and counter-extension upon the hand, while firm and steady pressure is made by the surgeon upon the head of the displaced bone.

Dr. Richard J. Levis has devised an apparatus for reducing dislocations of the fingers and thumb, which may be used with admirable effect, as it is a powerful means, not only for securing a firm hold, but for controlling the movements of the fingers during the necessary manipulations. The adjoining cuts, figs. 24 and 25, will convey a much better idea, both of the nature of the contrivance and of its mode of application and action, than any description, however elaborate. It will be perceived, at a glance, that the piece of wood, which is about ten inches in length by a little over one inch in width, affords the surgeon, by its long leverage, an opportunity of extending the luxated phalanx with great power, and of rotating it at the same time upon its axis, thus facilitating its disengagement from the rounded surface of the opposing bone. When properly applied, the apparatus is perfectly unyielding, and is in every respect preferable to the clove-hitch. In its construction, it is necessary to see that the tapes are strong and broad, otherwise they will be liable to break and cause severe contusion of the integuments. Each should be about two feet long.

Fig. 24.

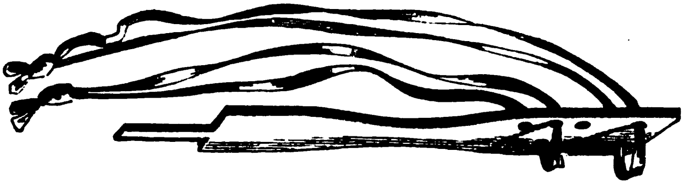
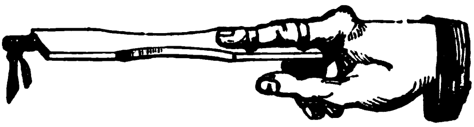


Fig. 25.



Dr. Levis's apparatus for reducing dislocations of the thumb and fingers.

The apparatus of Dr. Levis is similar to the spatha described by Celsus for reducing dislocations of the shoulder-joint, so much employed by the earlier practitioners.

Excepting by the bursting of a gun, or other severe violence, dislocation of the *carpo-metacarpal* joints must be regarded as an impossible occurrence, owing to the intimate manner in which the four last bones of the metacarpus are connected with each other and with the bones of the second row of the carpus. Under such circumstances the injury is generally so great as to render it necessary to resort to amputation, or excision, the latter operation always taking the place of the former when it is in our power to save any portion of the hand likely to be of service to the patient. Conservative surgery may do much in these cases to prevent mutilation by a careful use of the knife and pliers immediately after the occurrence of the accident, when the parts are tolerant of manipulation, and admit of being put in proper form for speedy reunion. A man who cuts off a whole hand, when the removal of a portion will suffice, has no just conceptions of his duty.

DISLOCATIONS OF THE CARPAL BONES.

From the firm connections and limited motions which characterize the carpal joints, it is evident that any displacement of them must be of very uncommon occurrence. Indeed, it was formerly asserted that such an accident was altogether impossible; a statement which has been contradicted by modern experience, which has not only established the fact, but elucidated the pathology and treatment of the lesion. All the carpal bones, however, are not equally liable to luxation; on the contrary, there are only three which appear to be susceptible of it—the magnum, cuneiform, and pisiform—and then only when there has been considerable relaxation of the ligaments, weakening their connections, and predisposing them to displacement under the application of comparatively slight force.

Of the three bones above mentioned, the *magnum* is the most liable to dislocation; women are supposed to be more subject to it than men, owing to the greater mobility of the carpal joints, and the weaker state of the ligaments. The accident is caused by forced flexion of the wrist, from falls upon the back of the hand, wrenching the bone from its connections with the head of the corresponding metacarpal bone, and pushing it out behind, where it forms a hard, well-defined tumor, which increases when the wrist is bent, and diminishes when it is extended. The displacement is always incomplete, and is apt to be followed by severe tumefaction, which often temporarily obscures the diagnosis.

The *reduction* is effected by firm pressure upon the bone made from behind forwards, or in a direction contrary to that of the displacement, the hand being at the time in an extended state, in order to insure greater relaxation of the soft parts, and to increase the opening from which the bone has been ejected. The operation must be conducted with great gentleness, and the surgeon must not be disappointed if he does not succeed in his first attempt. In case there is much inflammation, leeches and fomentations will probably be required. To maintain the reduction the hand must be placed in a straight position, upon two binder's board splints, well padded, and long enough to extend from the middle of the forearm to the ends of the fingers. If the tendency to displacement is very strong, as it usually is, it may be necessary to apply a compress directly to the luxated bone, with a view to a more direct concentration of the pressure. The apparatus must be worn for a long time, as the ligaments are very slow in uniting, but care should be taken, after the first fortnight, to take it off occasionally for the purpose of moving the wrist-joint, to prevent anchylosis.

Of dislocation of the *cuneiform* bone there is hardly a well authenticated case upon record; the accident can occur only when great force is applied, and must be treated upon the same general principles as the preceding.

The *pisiform* bone may be luxated by the action of the flexor muscle of the carpus, but only when its connections have been seriously weakened by disease of its ligaments. The occurrence is attended with some annoyance, and is difficult to remedy. When the accident is of sufficient importance to claim attention, the best plan is to place the hand in a slightly flexed position, in a tin-case, extending from the middle of the forearm to the metacarpo-phalangeal joints, the carpal piece being so arranged as to form an obtuse angle with the other. A compress is applied to the lower and inner part of the wrist, in the situation of the displacement, and confined by adhesive strips and a bandage.

DISLOCATIONS OF THE WRIST.

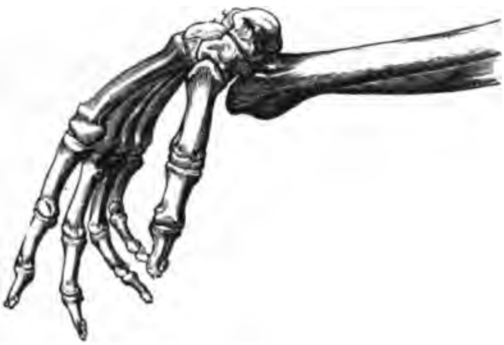
The possibility of dislocation of the wrist-joint, as an independent traumatic lesion, has been alternately admitted and denied by practitioners, from an early period of the profession down to the present moment. Dupuytren, after much patient attention to the subject, and the dissection of a number of cases simulating this accident, positively asserts that he never saw an instance of it, except as a result of organic disease of the articulation. He felt persuaded that the pretended cases which had been reported by various writers were nothing but cases of fracture of the inferior extremity of the radius, an accident which, as every one now knows, is of very frequent occurrence, and is generally attended with symptoms which closely simulate those of luxation of the wrist-joint. Observations, however, made since the time of the celebrated French surgeon, both in Europe and this country, indisputably prove that, although the lesion is exceedingly uncommon, its occurrence is not only possible, but that it has been repeatedly made the subject of the most satisfactory clinical study.

The reason of the great infrequency of this accident is altogether of an anatomical character. From the manner in which the lower extremity of the radius is connected with the scaphoid, semilunar, and cuneiform bones, it is evident that any severe force applied to the hand, as in falls upon the palm or dorsum, must promptly be transmitted through the carpus to the radius rather than to the ulna, which can hardly be said to enter into the composition of the joint at all, except in so far as it affords some degree of lateral support. The consequence is that the spongy and delicate structure of the radius, receiving the brunt of the injury, usually gives way, either at the articulation or in the lower sixth of its extent, instead of allowing itself to be dislocated; fracture of the brittle osseous matter being in general much easier than the laceration of the strong ligaments which naturally tie the contiguous surfaces together.

The carpal bones may be displaced from the radius and ulna backwards and forwards; lateral luxation cannot occur without fracture of one of the styloid processes, and then only in an incomplete manner.

In the luxation *backwards*, fig. 26, the carpal bones are driven up behind the ends of the two bones of the forearm, which lie in front of the muscles of the thenar and hypothenar eminences; the consequence is, that there is great deformity of the wrist-joint, its antero-posterior diameter being much increased, although its breadth is nearly natural. The forearm is somewhat shortened, the hand and fingers are forcibly flexed, and the ulna is thrown considerably forwards and inwards beyond the line of the carpus. The radius and ulna retain their normal length, and the prominence on the back of the joint is characteristically hard, convex, and transversely elongated.

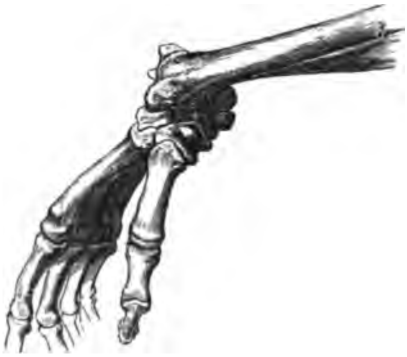
Fig. 26.



Backward dislocation of the carpus.

In the dislocation *forwards*, fig. 27, the symptoms just described are reversed, the carpal bones lying in front, and the end of the radius and ulna behind. The hand and fingers are powerfully extended, the distance between the elbow and wrist is sensibly diminished, although the two bones retain their proper length, and the styloid processes can be distinctly felt behind at the lateral aspect of the hand, with the articular groove which naturally separates them, and which is now occupied by the tightly stretched extensor tendons.

Fig. 27.



Forward dislocation of the carpus.

These two dislocations are liable to be mistaken for fracture of the lower extremity of the radius and ulna, although such an accident could hardly happen in the hands of a scientific surgeon, perfectly vigilant, and bent upon the discharge of his duties. The principal points of distinction are, that, in luxation, there is much more of a tumor than in fracture, that the tendons of the hand and fingers are more evidently affected, being either violently extended or flexed, that the radius and ulna retain their normal length, and that the bones are, as it were, firmly interlocked with each other. In fracture of the radius, or of the radius and ulna, on the contrary, the deformity is less marked in the antero-posterior diameter, the two bones, if both are broken, are sensibly shortened, there is much more mobility, and, upon bringing the fragments in contact with each other, and then grasping the lower part of the forearm with one hand, while the patient's hand is moved with the other, crepitation may readily be elicited. Moreover, in luxation the styloid process of the ulna generally lies upon a plane somewhat anterior to that of the radius, whereas in fracture it is behind that bone.

The *reduction* of these two dislocations is sufficiently easy. All that is required, in order to accomplish it, is to extend the hand and counter-extend the forearm, just above its middle, while pressure is applied by means of the thumbs upon the displaced carpal bones in a direction opposite to that of the luxation. The limb, enveloped in a roller, is supported upon a light splint, stretched along its palmar aspect, and kept constantly wet with some evaporating lotion. In due time passive motion is instituted, to prevent anchylosis, which is so liable to occur after all injuries of this and other joints.

Congenital dislocations are occasionally met with at the wrist, and have of late years attracted much attention, chiefly through the labors of Dupuytren, Cruveilhier, Guérin, and R. W. Smith. The carpal bones may be thrown forwards or backwards, forming, in either case, a well-marked, characteristic, angular prominence. The lesion is attended with atrophy of the bones, ligaments, and muscles; the hand is generally useless, and the fingers are variously deformed, being usually wasted and crooked. I have lately seen a well-marked case of lateral displacement of the wrist in a puny female infant, three weeks old, the hand presenting towards the radius. Treatment is seldom of any avail.

DISLOCATIONS OF THE RADIO-ULNAR JOINTS.

1. The *inferior radio-ulnar* joint is liable to displacement in two directions, the ulna being thrown backwards in the one case, and forwards in the other, beyond the line of the radius. The slightest anatomical inspection will serve to show, what experience has proved to be true, that the former luxation must be the more frequent of the two, though both are sufficiently rare as an uncomplicated lesion. As an accompaniment of fracture of the lower extremity of the radius, it is by no means uncommon; generally, however, only in a partial manner.

The dislocation *backwards* is usually the result of violence applied to the hand or forearm, during strong pronation, any sudden twist or wrench of the joint predisposing to its occurrence. The signs are characteristic. The hand is in a fixed state of pronation, and inclined a little towards its inner margin; the head of the ulna, directed obliquely across the radius, forms a distinct prominence above the level of the cuneiform bone; the fingers are slightly bent; the styloid process has lost its parallelism with the fifth metacarpal bone; and the inferior extremity of the forearm has an appearance of being unnaturally narrow, though, if some time has elapsed since the accident, this will probably be masked by the swelling. The reduction is effected by flexing the forearm at a right angle with the elbow, and then gradually but determinedly extending the hand, and rotating it outwards until it is brought into the supine position, when the bone will usually resume its natural relations.

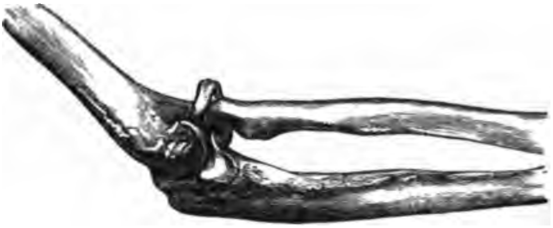
The lower extremity of the ulna may be displaced *forwards* by a fall upon the wrist, by a violent wrench of the hand while in a state of supination, or by injury applied directly to the forearm. The accident is one of uncommon occurrence. The symptoms are the reverse of those in the preceding dislocation; that is, the ulna, lying across the anterior part of the radius, forms a remarkable projection just above the carpus, while the forearm and fingers, slightly bent, are powerfully supinated, and cannot be brought out of this position without restoring the joint to its normal condition. The reduction is effected in the same manner as in the luxation backwards, the limb, as the bone yields, being gradually but forcibly pronated.

It will be necessary after both these luxations, as the ligaments will be a long time in uniting, to keep the limb well bandaged, and supported by means of a padded splint, extending from near the elbow to the ends of the fingers. A firm compress is to be placed over the inner and fore part of the joint the more thoroughly to protect it against a recurrence of the accident.

2. Dislocation of the *superior radio-ulnar* joint may occur in three different directions, the head of the radius being thrown from the sigmoid cavity of the ulna forwards, backwards, and outwards, the frequency of the accident being in the order here stated, although some authorities contend that the displacement backwards is the most common. This I have not found to be the case in my own practice.

The chief causes of dislocation *forwards*, fig. 28, are falls upon the palm of the hand, in which, the forearm being powerfully supinated, the head of the radius receives the whole force of the blow, and is thrown against the coronoid process of the ulna and the external condyle. The accident, which is most common in young subjects, may also be produced by direct injury to the upper extremity of the bone, acting from behind forwards.

Fig. 28.



Dislocation of the head of the radius forward.

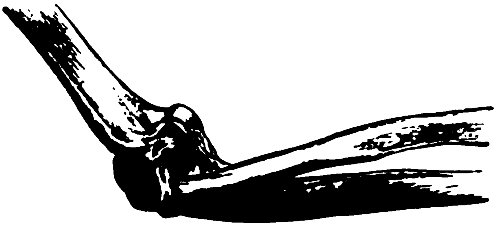
The *signs* of this accident are quite characteristic. There is an obvious vacuity at the upper and outer part of the limb, and the head of the radius can be distinctly felt in its new situation, in front of the elbow, rolling about under the finger, upon rotating the lower extremity of the bone. The forearm, slightly flexed, is in a state midway between pronation and supination, and every attempt to bring it in a straight line or to a right angle with the elbow is unsuccessful. When an effort is made to bend the limb suddenly, the head of the radius will be found to strike against the lower and fore part of the humerus and refuse to advance; a circumstance which is characteristic of the nature of the accident. This dislocation is usually described as being accompanied by forced supination of the hand, but, in general, though not always, the position is as here stated.

The *reduction* is accomplished by applying extension to the hand and counter-extension to the middle of the arm, while the forearm, being semi-flexed, in order to relax the two-headed flexor muscle, is forcibly supinated, at the same time that the surgeon pushes the head of the radius downwards and backwards, in the direction of its natural position.

The most common cause of luxation *backwards*, fig. 29, is violence applied to the hand when the forearm is in a state of pronation, and carried beyond the natural line of the body.

The peculiar attitude of the limb in this luxation is almost characteristic of the nature of the injury. The forearm is semi-flexed, and, together with the hand, in a fixed state of pronation; the fingers are also somewhat bent, and there is an evident void at the upper and outer part of the forearm, just below the elbow, while a short distance beyond this, over the external condyle, by the side of the olecranon process, the prominence formed by the head of the displaced radius is distinctly perceptible, feeling hard and firm,

Fig. 29.



Dislocation of the head of the radius backward.

and but faintly responding to any motions that may be impressed upon the lower extremity of the bone. Any attempt, short of what is requisite to effect the reduction, to supinate the limb, to bring it in a straight line, or to flex it at a right angle with the arm, is quite abortive, owing to the manner in which the radius hitches against the humerus.

Reduction is effected by making extension upon the hand and counter-extension upon the lower part of the arm in the line of the displacement, while the surgeon presses the head of the radius from behind forwards, towards the lesser tubercle of the humerus, at the same time that the hand and forearm are gradually but forcibly supinated. When the patient has not been relaxed by chloroform, the return of the bone is always indicated by a distinct snap.

Dislocation of the radius *outwards* is not as common an accident as either of the preceding varieties of displacement. It occasionally exists, in an incomplete form, as a result chiefly of a relaxed condition of the annular ligament, in persons of a feeble habit of body. Complete luxation outwards can happen only when there is a rupture of the upper extremity of the interosseous ligament, and hence the lesion is apt to be complicated with fracture of the humerus or ulna, and severe injury of the soft parts. A fall upon the palm of the hand, propelling the radius upwards and outwards, with the whole force of the leverage of this bone, is the most common cause of the accident.

The *symptoms* are generally well-marked. The head of the radius, resting upon the epicondyle of the humerus, forms a distinct prominence at the outer part of the elbow, easily recognized by the finger; the bone is situated higher up than natural, the distance between it and the olecranon being materially increased; the forearm is in a state midway between pronation and supination, the latter of which is impossible; and the movements of flexion and extension are of course much impeded. Besides these signs, there is always a cord-like prominence along the front of the radius, as well as on the inside of the displaced head, formed by the tension of the external radial and long supinator muscles, which is gradually lost upon the outer and anterior surface of the limb. The reduction is effected by pushing the radius downwards and forwards, the forearm being bent at a right angle, and extension and counter-extension made in the usual manner.

The *reduction* of all these dislocations is generally sufficiently easy, but they are extremely liable to recur from the slightest causes, and it is, therefore, an object of great consequence, in the after-treatment, to guard against the accident by the use of the compress and bandage, aided by a suitable apparatus, to insure perfect quietude, until the ligamentous structures have had an opportunity of uniting. Meanwhile, passive motion must be attended to, lest anchylosis ensue.

The superior radio-ulnar joint is liable to a species of *subluxation*, similar to what occurs in the temporo-maxillary articulation. I have seen several well-marked cases of it, in one of which it existed simultaneously on both sides; and in all it was manifestly dependent upon a relaxed condition of the annular ligament, allowing the head of the radius to move away to some distance from the sigmoid cavity of the ulna. The subjects of this displacement are, for the most part, thin, weakly children of a strumous habit of body, and my experience shows that females are more frequently affected than males. The movements of the joint are not materially impaired by the occurrence, unless it persists and gets worse, when the whole limb may become enfeebled in consequence. The cold douche, tincture of iodine, and a series of small blisters, with tonics to improve the general health, are the best remedies.

Another form of dislocation liable to happen in this articulation is the *partial traumatic*, as it may be termed, chiefly met with in young children, from a sudden jerk, pull, or twist of the forearm, when the limb is in an overstretched state of pronation, the small size of the sigmoid cavity of the ulna at this period of life, and probably also a relaxed condition of the ligaments of the joint, favoring the occurrence. The accident is usually caused by the nurse in lifting the infant over the gutter, in dragging it rudely up to her side, or in her attempts to prevent it from falling. The head of the radius may be thrown either backwards or forwards, but the former displacement is by far the more common. The symptoms are generally well-marked. A slight noise or snap is usually noticed at the moment of the accident; the child screams and is in great pain; the limb hangs motionless by the side; the forearm is slightly flexed, and the hand, strongly pronated, cannot be supinated without excessive suffering. There is ordinarily no swelling or deformity at the seat of the injury, not even after the lapse of several days.

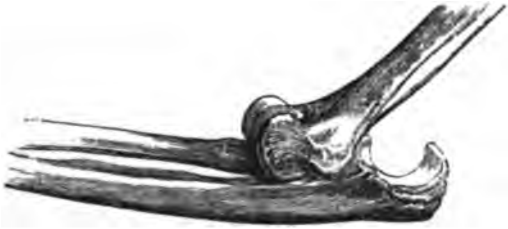
The reduction, which occasionally occurs spontaneously during sleep, or during the manipulation necessary to detect the nature of the accident, is readily effected by extension and counter-extension at the hand and lower part of the arm, while an effort is made to force the forearm into a state of supination.

DISLOCATIONS OF THE ELBOW.

The dislocations of the elbow-joint form a subject of the deepest possible interest to the surgeon, not only on account of the frequency of their occurrence, but because of their great liability to serious complications and the consequent difficulty of their diagnosis and treatment. I am satisfied, from no little observation, that there are no luxations in the whole body which are so little understood, or so unscientifically managed, as those now under consideration. The principal reason of this is the want of correct knowledge of the structure of the elbow-joint, and of the complex arrangement of its osseous elements, with which few practitioners take the trouble to make themselves acquainted. The result is that cases of dislocation constantly occur, which are mistaken for fracture, and which are therefore entirely neglected until it is too late to remedy them by means which, if timeously employed, would nearly always be sufficient to insure the reduction of the displaced bones, and the restoration of the bruised and lacerated structures, with complete recovery of the functions of the articulation. I make these remarks because it has been my lot to see an unusually large number of badly-treated cases of dislocation of the elbow-joint, in almost every stage after their occurrence, from the first few hours to several months, when, in general, all hopes of benefiting the patient must be abandoned.

The most common dislocation of the elbow is that in which both bones of the forearm are thrown upwards and backwards against the posterior surface of the humerus. Displacement forwards is exceedingly infrequent, and can only occur, as a general rule, when the accident is complicated with fracture of the olecranon process, whereby the ulna is permitted to glide in front of the joint, which it must have great difficulty in doing when its superior extremity remains intact. Lateral luxation of both bones of the forearm from the condyles of the humerus is also very uncommon, and is necessarily incomplete, owing to the great extent of the articular surfaces in this direction, and the number, size, and strength of the muscles and ligaments surrounding the joint. Of the displacements of the superior radio-ulnar articulation, a sufficient account has already been given. The ulna alone is sometimes luxated upwards, the olecranon forsaking the sigmoid fossa of the humerus, and applying itself against the posterior surface of that bone.

Fig. 30.

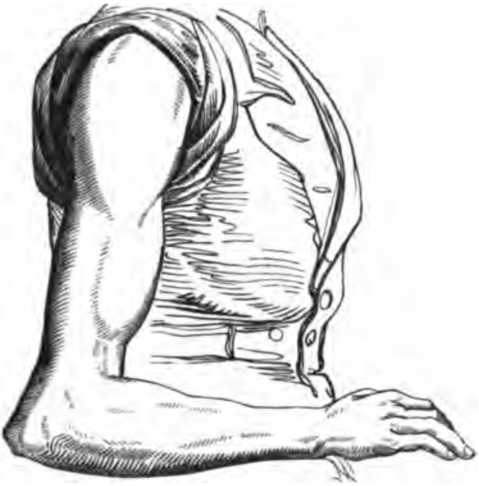


1. Dislocation of the bones of the forearm *backwards*, fig. 30, or, more correctly speaking, backwards and upwards, usually occurs from falls in which the person, instinctively stretching out the arm to protect the body, receives the whole shock upon the palm of the hand. The two bones being thus impelled by the surface struck by the hand, and the humerus by the weight of the body coming in the opposite direction, the two forces explode at the elbow-joint, rupturing the ligaments, and driving the

olecranon and head of the radius backwards and upwards. There can be no doubt that a contorted state of the forearm at the moment of the accident greatly promotes the luxation by increasing the strain.

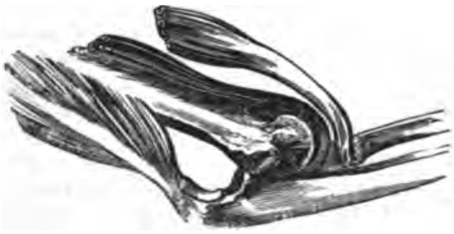
The *signs* of this dislocation are sufficiently obvious, presenting little variation in their character, unless it is conjoined with other injury. The limb is in a semi-flexed state, and there is great deformity of the elbow, as seen in fig. 31. At the posterior part of the joint is the unnatural projection formed by the olecranon, and, in front, the still more conspicuous one formed by the condyles of the humerus, fig. 30 and fig. 32, both usually perceptible by sight and touch, especially in lean subjects, and before the supervention of swelling. The forearm has generally a slightly twisted appearance, and occupies a position midway between pronation and supination, inclining, however, more to the latter than the former; any attempt to flex or extend it is not only very painful, but in great measure impracticable. The fingers are somewhat bent, and the distance between the elbow and wrist is sensibly diminished, generally from an inch to an inch and a half, but only in front, for behind the limb retains its normal length. The muscles in front of the joint, especially the flexor and brachial, are stretched like tense cords over the condyles of the humerus, while the tendon of the three-headed extensor is carried away from the bone behind, and stands out in bold relief, forming one of the most conspicuous signs of the accident. Although generally the forearm is semi-flexed, and nearly immovable, yet occasionally it is almost straight, and can readily be bent and extended, though not without great pain.

Fig. 31.



Dislocation of the ulna and radius backward.

Fig. 32.



Dislocation of the bones backward, showing the manner in which the muscles are put on the stretch.

Notwithstanding that the signs of this dislocation are usually characteristic, cases, nevertheless, occasionally occur where the *diagnosis* is painfully obscured. Two circumstances principally contribute to render it so. One is the inordinate swelling which so generally follows the accident, and which is often present in a high degree before the surgeon has an opportunity of examining the parts; the other, the existence of fracture of the bones composing the joint. When the humerus is broken off just above the condyles, the deformity will closely simulate that produced by dislocation backwards, the lower fragment, with the radius and ulna, being drawn in that direction, so as to give the back of the elbow a very prominent and distorted appearance, while the upper fragment will present itself quite conspicuously in front, under the flexor muscles. The points of distinction are that, in dislocation, the parts are fixed, and cannot be restored without a good deal of force, whereas, in fracture, they are easily moved and replaced, returning, however, to their unnatural situation the moment the efforts are discontinued. In dislocation, moreover, there is actual shortening of the anterior part of the forearm, but none in fracture; nor is there, in the former, any crepitation, which is so conspicuous in the latter. Fracture of the olecranon can always be distinguished by the elevation of the upper fragment, and the wide gap which separates it from the lower, and by the facility with which the surgeon can flex and extend the forearm. In fracture of the head of the radius, there is no deformity of the posterior part of the elbow, and by grasping the bone with the thumb and finger above, as it is being rotated below, crepitation may easily be elicited, thus at once clearing up the diagnosis.

The *reduction* of this dislocation is extremely easy, if attended to immediately after its occurrence, but very difficult if it be neglected even for a short time. I have no recollection of ever being foiled in a recent case, while I can recall to mind a large number of examples where everything that could be done proved unavailing after the third week, and sometimes even by the end of the second. I am not prepared to assign any reason for this; to say why a displacement, that is always so easily rectified, if properly managed, in its earlier stages, should so soon become utterly irreducible, resisting and defying all the best directed efforts of the surgeon. We can hardly suppose that it is owing exclusively to inflammatory adhesions, for it is difficult to conceive that they could become either so extensive or so firm, in so short a time, as to produce such a result; but, whatever the true explanation may be, the fact remains, and this is all that is really necessary to be known. The practical rule, then, to be deduced from this experience is that all dislocations of the elbow backwards should receive the earliest possible attention, their reducibility being in an inverse ratio to their duration.

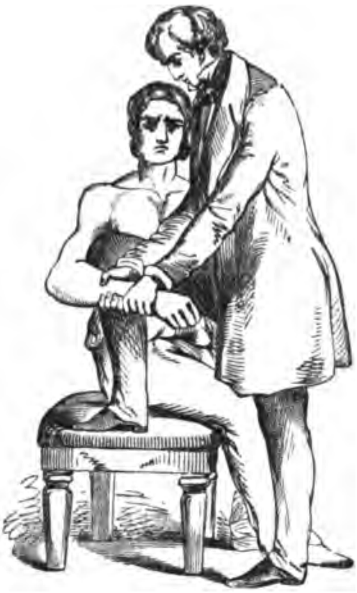
But, although it is undoubtedly true that it is always extremely difficult, and sometimes entirely impracticable, to reduce a dislocated elbow at the end even of two or three weeks, yet I would by no means wish to be understood as opposing an attempt to accomplish this object when the case is of five, six, or even eight weeks' standing; inasmuch as there are upon record quite a number of examples illustrative of the propriety of this advice. I have myself met with several instances in which my efforts were rewarded, if not with complete, certainly with very encouraging, results, at the end of nearly two months.

The reduction of this dislocation may be effected by various methods. The one which I have usually found most efficient, and which, I believe, has not been practised by any one else, is to place the heel in the bend of the arm, the patient lying down, and the surgeon carrying his leg across the chest, while extension is made by pulling the hand and wrist. This procedure affords the operator an opportunity of exerting his strength to great advantage, and I have not seen a case of recent dislocation that could resist his efforts beyond a few minutes. As the bones yield the forearm is bent towards the chest over the fulcrum, furnished by the foot, a step which materially promotes the reduction. The force of the extension may be greatly increased by securing a stout lac round the limb, just above the wrist, and throwing the noose over the neck and shoulder. Counterpressure may also be advantageously made by an assistant placing his hands against the shoulder of the affected side. The patient should, of course, be under the influence of chloroform.

Another method, which is also very advantageous, is to make a fulcrum of the knee in the bend of the arm, as in fig. 33, the patient being seated upon a chair, and the surgeon standing by his side in front, with his foot resting upon a high stool or upon another chair. The extension being conducted as in the previous case, the forearm is gradually brought over the knee so as to disengage more effectually the ulna and radius from the lower extremity of the humerus. This manœuvre is usually very promptly successful.

A third method of reduction, based upon the same principles as the preceding, is to bend the limb forcibly round a bedpost, which is thus made to act as a fulcrum, while the requisite extension is made by pulling the hand and wrist. This plan, however, although efficient enough, has the disadvantage of being both awkward and painful.

Fig. 33.



Reduction with the knee in the bend of the elbow.

Finally, the reduction may often be readily effected by seating the patient upon a chair, and requesting two assistants to make extension and counter-extension, one grasping the wrist, the other the middle of the arm. The surgeon, standing behind the affected limb, then places his thumbs firmly upon the olecranon, and thus aids in pushing this process downwards and forwards into its natural position.

When any great difficulty is expected, as when the patient is very muscular, or the joint has been luxated for some days, or several weeks, the best method, after the ordinary procedures have failed, is to use the pulleys hooked to the noose round the lower extremity of the forearm, and to a staple in the wall, floor, or bed. The counter-extending band is secured round the middle of the arm, and is either confided to two stout assistants, or fastened to some firm object behind the patient's head and shoulder. The patient should, of course, be recumbent, and fully anæsthetized. After the extending forces have been maintained for some time, the return of the bones will be promoted by steady pressure upon the olecranon. When these means fail, as they will be extremely apt to do if the case is of longer standing than three weeks, it has been proposed to insert a narrow bistoury into the joint, so as to divide the resisting structures; but the operation, besides being dangerous, on account of the proximity of the brachial artery and the several nerves of the limb, has not realized the expectations that had been formed of it by its advocates.

Reduction being effected, the limb, carefully bandaged, must be supported in a light tin-case, and kept constantly wet with evaporating lotions. If the inflammation run high, as it generally does after such an injury, leeches and even venesection may become necessary. In every case, however simple, the greatest vigilance must be employed to prevent anchylosis. Passive motion must, of course, receive early attention.

In decidedly chronic cases of this accident, but where there is still a good deal of motion, the patient may often obtain a very fair use of the joint by breaking the olecranon process by forcible flexion of the limb. I have pursued this plan with excellent results in several instances, and equally encouraging effects have attended it in the hands of Crosby, Mussey, and other surgeons.

2. Dislocation of the bones of the forearm *forwards* is an extremely rare event, which was formerly supposed to be altogether impossible without previous fracture of the olecranon, or extensive laceration of the soft parts. Modern observation, however, has shown the fallacy of this opinion, by adducing several unequivocal cases in which the displacement existed as a pure, uncomplicated affection. The manner in which the occurrence may happen is not well understood; but from some experiments performed upon the dead subject it would seem that if, while the forearm is powerfully flexed upon the arm, severe violence be applied directly to the olecranon and head of the radius, the articular surfaces of these bones may be thrown forwards from the condyles of the humerus with much greater facility than would at first sight appear possible. But, whatever explanation may be offered, the fact is that the accident must necessarily be attended with extensive rupture of the ligaments, and generally also with pretty severe contusion of the soft parts. A majority of the published cases of this

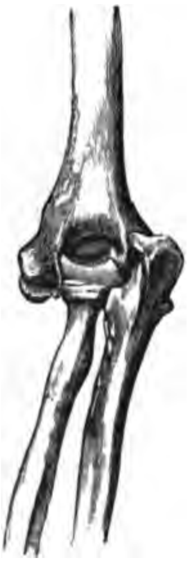
accident have been observed in subjects under fifteen years of age, in consequence of falls upon the posterior part of the elbow.

The *signs* of the dislocation are sufficiently characteristic. When the ulna and radius are thrown completely forwards, in front of the condyles of the humerus, the forearm will necessarily be considerably shortened, whereas, when they retain their relation with the condyles, it will be elongated to the full extent of the length of the olecranon. The forearm, moreover, is slightly flexed, but by a little effort it may readily be extended, or even bent somewhat backwards. The integuments and muscles in front of the joint are in a state of tension; the end of the humerus can easily be felt posteriorly, where it forms a large prominence, and there is a well-marked depression, a kind of vertical gutter, in the natural situation of the olecranon, bounded on each side by the margins of the trochlea.

Two methods of *reduction* may be employed for this dislocation; one consists in flexing the forearm at a right angle with the elbow, and making extension by pulling the hand and wrist, while the heel is applied as a fulcrum to the lower third of the arm, the patient being under the influence of chloroform. Or, instead of this, the extending and counter-extending forces may be applied to the hand and shoulder, the limb being in a straight position, and pressure made upon the ulna and radius by means of the thumbs. During the after-treatment, leeches and fomentations will probably be required, and the limb must be supported in splints or a tin-case until the parts have united. Passive motion must be commenced at an early period.

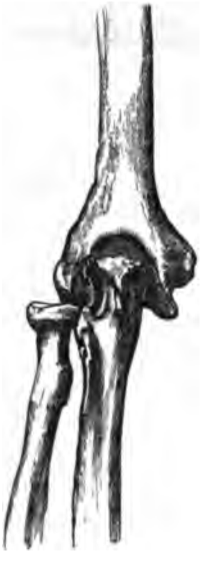
3. *Lateral* dislocation of the elbow-joint, besides being extremely rare, can scarcely occur in any other than an incomplete form, and as a consequence of severe injury extensively implicating the soft parts. The most common cause of the accident is a fall upon the wrist or hand when the forearm is in a flexed and contorted state; and the displacement will be so much the more likely to happen if, the moment the extremity strikes the surface, the arm is forcibly impelled sidewardly. It may also be produced by violence acting directly upon the forearm and arm in opposite directions, as when the former is driven inwards and the latter outwards. In a case mentioned by J. L. Petit the accident was occasioned by the limb becoming entangled in the spokes of a wheel. The displacement may be inwards or outwards, and is often associated with partial dislocation backwards.

Fig. 34.



Lateral dislocation inward.

Fig. 35.



Lateral dislocation outward.

In the dislocation *inwards*, fig. 34, there is great deformity at the ulnar side of the elbow, produced by the olecranon and head of the radius, the latter hitching against the inner condyle, while the outer condyle presents an unusual prominence immediately beneath the integuments at the external aspect of the joint; the forearm is partially bent, and somewhat supinated; and the muscles of the arm, both in front and behind, are dragged inwards by the displaced bones.

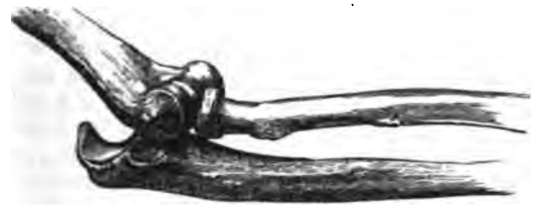
In the luxation *outwards*, fig. 35, the ulna rests upon the external condyle, while the inner condyle forms a sharp prominence on the inside of the elbow; the forearm is slightly bent and rigidly pronated; the motions of flexion and extension are much impeded; and the flexor and extensor muscles are in a painful state of tension. Both in this and in the inward displacement there is a remarkable increase in the breadth of the articulation, along with considerable flattening of its anterior surface, and a twisted condition of the forearm.

These luxations are easily reduced by extension and counter-extension, performed in the usual manner, and by coaptation by pressing the bones in a direction opposite to that of their displacement. In general, the object may easily be attained by simply bending the elbow over the knee, as in the dislocation backwards. The after-treatment requires great care, both to prevent re-displacement and anchylosis.

The only instance of complete lateral dislocation of the elbow with which I am acquainted is one recorded by Nélaton. It was observed in a man, aged sixty, who was admitted for another disease, the accident having taken place twenty years previously from a fall from a height of thirty feet. The elbow was much deformed and anchylosed.

4. Dislocation of the *ulna* alone directly *backwards* is an uncommon accident, and can scarcely be complete without fracture of the coronoid process. The signs are usually characteristic. The forearm and hand are slightly flexed, and inclined inwards as if they were twisted on their axis; the olecranon forms a prominent projection at the back part of the joint, as in fig. 36; and the head of the radius, though usually somewhat displaced, may be distinctly felt in its natural situation during the movements of flexion and extension, both of which, but particularly the latter, are very much restricted and painful. The accident generally arises from severe falls upon the inner and upper part of the hand, suddenly and forcibly impelling the ulna upwards and backwards, away from the head of the radius; the coronoid process lodging in the sigmoid cavity of the humerus. Its most prominent features are the contorted state of the limb and the remarkable projection of the olecranon, which will always serve to distinguish it from other lesions. When the coronoid process is broken off, the posterior deformity will be unusually great, and, although it may be effaced by extension, yet the moment the arm is left to itself it returns.

Fig. 36.



Dislocation of the ulna backward.

The *reduction* may generally be easily effected by bending the arm over the knee, and extending the hand and wrist. Coaptation may be aided, if necessary, by pressure upon the olecranon with the thumbs. When the accident is attended with fracture of the coronoid process, special retentive means will be necessary, of which the best is a rectangular tin-case, the limb being properly bandaged, and a compress firmly bound over the olecranon.

5. Finally, the bones of the forearm are occasionally dislocated simultaneously in *opposite directions*, the ulna being thrown backwards behind the humerus, and the radius forwards upon a plane with the external condyle. The occurrence is uncommon, not more than five or six cases having been reported, and of these none have occurred in my own practice. It is produced by falls from a considerable height upon the hand, impelling the two bones with great violence at a moment when the forearm is considerably flexed and forcibly twisted upon its axis. It is readily recognized by the singular form of the elbow, which is sensibly shortened transversely, but much increased in its antero-posterior diameter; by the great prominence at the back of the limb, formed by the olecranon process; and by the remarkable inward contortion of the forearm and hand, which are both slightly bent. On attempting to flex the limb, the head of the

radius is found to hitch against the humerus, and to offer an insurmountable barrier to further progress. The reduction of the ulna is readily effected by placing the knee in the bend of the arm, and then pulling the hand and wrist; but that of the radius is more difficult, and will require, in addition, pressure upon the dislocated head outwards and backwards.

Compound dislocations of the elbow constitute a serious class of lesions, liable to be followed by the worst results, both immediate and consecutive. Such is the extent of the articulating surfaces that any considerable exposure by wound is extremely apt to cause ulceration of the cartilages and caries or necrosis of the bones, requiring their eventual removal, or, what is worse, the sacrifice of the limb. The danger is materially increased when there is fracture with displacement, the end of one of the bones perhaps protruding in the form of a sharp spiculum at the wound. Such cases will seldom do well if an attempt is made to replace and save the parts in the usual manner. The patient, if young and vigorous, may, it is true, occasionally progress favorably, but the chances are that the limb will, by and by, have to come off, or that life will be brought in imminent danger by the protracted suppuration, ulceration, and hectic irritation. When, therefore, the symptoms are at all unpromising—the joint being extensively opened, the muscles torn, and the bones seriously involved—the best plan, as a general rule, will be to amputate on the spot, that is, the moment reaction has occurred; or, under more auspicious, but still trying, circumstances, to excise the ends of the injured bones, placing them afterwards in such a position as to insure their speedy reunion, and, at the same time, in as good a one as possible for the future usefulness of the limb.

The elbow is sometimes dislocated as a *congenital* defect; the accident presenting itself, however, only in a partial form. Most generally the displacement is limited to the head of the radius, which, forsaking the sigmoid cavity of the ulna, applies itself against the outer condyle. The movements of the elbow and forearm are restricted, but not annihilated; and, as the head of the luxated bone always becomes remarkably elongated as the patient advances in years, reduction is only practicable in infancy and early childhood.

DISLOCATIONS OF THE SHOULDER.

Dislocations of the shoulder-joint are of common occurrence, and, therefore, deserving of great attention. As stated elsewhere, they are more frequent than all the other dislocations together, a circumstance which is easily accounted for by the shallow condition of the glenoid cavity of the scapula, and the extraordinary latitude of motion peculiar to this articulation. Moreover, there is in many persons, females and children especially, a remarkable tendency to relaxation of the ligaments and muscles of the shoulder-joint, which thus powerfully predisposes to luxation, the slightest accident being, under such circumstances, often sufficient to produce it.

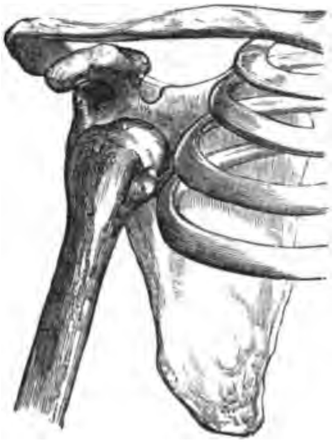
Experience has shown that dislocations of the shoulder are not nearly as common in women as in men; simply, however, I imagine, for the reason that they are much less exposed than the other sex to the various exciting causes of these lesions.

Age exerts a material influence upon their production. The statistics of Malgaigne and others show that children under fifteen years rarely suffer from them. I have myself not seen a solitary example before the age of twelve. From fifteen to twenty-five, the accident is also comparatively rare, but from this period on it becomes more common, and from forty to sixty it reaches its maximum. After sixty, there is a marked decline in its frequency, and few cases are met with after seventy.

The nomenclature of these accidents has been much encumbered by distinctions and refinements, which, so far from simplifying the subject, only serve to embarrass it. There are, in fact, only three principal dislocations of the shoulder; all the rest, concerning which so much has of late been written, are mere varieties, hardly entitled to separate consideration. These dislocations are the axillary, thoracic, and scapular. In the first, as the name implies, the head of the humerus is situated in the axilla, under the glenoid cavity; in the second, below the clavicle, on the anterior and lateral aspect of the chest; and in the third, on the scapula, beneath the spine of that bone. To these may be added, as varieties of the first two luxations, those cases in which the head of the bone has been found in the subscapular fossa, and upon the anterior part of the neck of the scapula, below the coracoid process. The nomenclature here suggested, besides indicating the situation of the luxated bone, is in strict conformity with that of the dislocations of the hip-joint.

1. The *axillary dislocation*, by far the most frequent of all, is usually occasioned by violence applied to the elbow or hand, the limb being elevated, and widely removed from the body. It may also be produced, when the arm is in this position, by a fall or blow upon the shoulder, acting directly upon the head of the humerus. I have met with five cases in which the accident was caused by muscular contraction. In four of the cases, the luxation happened in an attack of epilepsy, and in the other in consequence simply of inadvertently raising the arm above the level of the head. However induced, the head of the humerus will be found to be in the axilla, just beneath the glenoid cavity, lying upon the inferior border of the scapula, fig. 37, between the subscapular muscle and the long head of the triceps. The axillary vessels and nerves are somewhat compressed, the capsular ligament is largely opened below, and the articular muscles are nearly always more or less lacerated, if not partially separated from their attachments. The supra-spinate and deltoid muscles, but particularly the former, are violently stretched and spasmodically contracted; the broad dorsal and great pectoral, on the contrary, are usually a little relaxed.

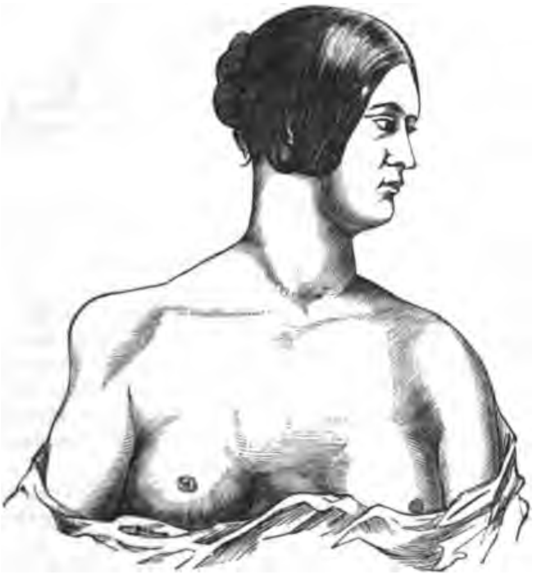
Fig. 37.



Dislocation of the humerus into the axilla.

The *symptoms* are, inordinate prominence of the acromion, as exhibited in fig. 38, which is much more sharp and distinct than naturally, with a well-marked depression just below this process; flattening of the shoulder, and unusual fulness of the axilla, caused by the presence of the displaced bone, which, on motion of the limb, can easily be felt rolling about between the thumb and fingers, especially in lean subjects. The height of the axilla is at least an inch to an inch and a half greater than on the sound side. The elbow projects considerably from the side, in consequence of the tension of the deltoid muscle, the forearm is slightly bent, the arm is perceptibly length-

Fig. 38.



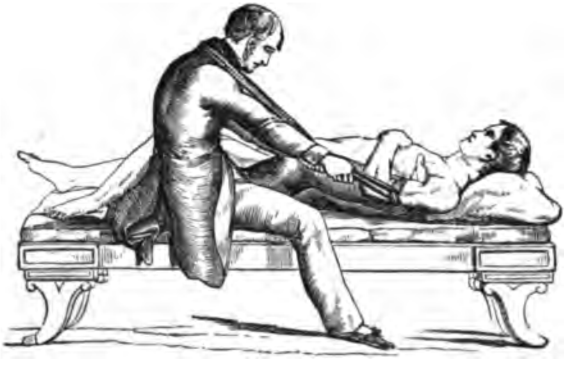
Dislocation of the humerus into the axilla.

ened, the fingers are numbed, from compression of the axillary nerves, and the whole extremity, stiff and powerless, is generally somewhat supinated, although not necessarily so, for I have repeatedly seen it inclined in the opposite direction. Flexion of the forearm, also, is not an invariable occurrence; generally it is said to be so, but several cases have come under my observation where the patient was able to extend and bend it at pleasure. When the biceps and triceps are put considerably upon the stretch, as happens when the head of the bone is thrown unusually far inwards, the limb often presents a singularly twisted appearance.

It seems hardly credible that an accident which is always so well marked as dislocation of the head of the humerus downwards into the axilla should ever be overlooked, or mistaken for any other lesion, and yet such is the fact, as daily experience abundantly attests. The most reliable *diagnostic signs* are the flattening of the deltoid muscle, the projection of the acromion process, the fulness and increased height of the axilla, and the separation of the elbow from the side of the body and the inability of the surgeon to approximate it to the middle line without compelling the patient to depress the corresponding shoulder. The latter symptom I regard as especially valuable, for I know no other lesion that simulates it. Another sign, also, of great certainty, as has been shown by Dr. Dugas, is that neither the patient nor the surgeon can place the fingers of the injured limb upon the sound shoulder, while the elbow touches the front of the chest.

Various methods may be employed for effecting the *reduction*, but the best of all is to place a fulcrum in the axilla, upon the head of the luxated bone, while extension is made upon the forearm, just above the wrist. The best fulcrum for this purpose is the heel of the surgeon, divested of its boot, he and the patient lying in opposite directions upon a bed or table; and the efficiency of the operation will be materially increased, if, after the extension has been maintained for a little while, the limb is gradually brought forwards over the body, so as to raise the bone upwards and outwards to a level with the glenoid cavity. I sometimes find that I can reduce the dislocation more promptly and with less effort by sitting between the patient's limbs, with my own leg carried obliquely over the trunk, as this affords a much more powerful leverage than in the ordinary procedure. When unusual resistance is encountered, the extension should be aided by means of a stout fillet, secured round the forearm by the clove-hitch, and thrown across the surgeon's neck and shoulder. Finally, care should be taken not to raise the patient's head with a large pillow, nor yet to let it lie entirely flat, as both these positions would have a tendency to impede the reduction. Slight elevation only is desirable.

Fig. 39.

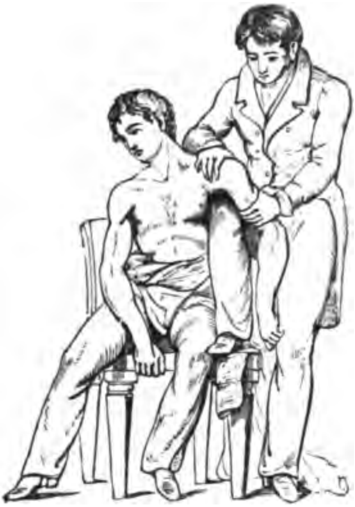


Reduction with the heel in the axilla.

Dr. Garms, instead of placing the patient upon his back, makes him lie upon the abdomen. Two towels are fastened round the arm, one just above the elbow, the other a short distance below the shoulder. The latter is then given in charge of an assistant, standing on the affected side, to draw the arm laterally, while the operator, sitting on the floor, seizes the former, and applying the heel in the usual manner, makes extension downwards and backwards. The operation is particularly applicable to the axillary form of the accident, and is so simple as not to require the aid of chloroform.

Occasionally the reduction is readily accomplished by making a fulcrum of the knee, as in fig. 40, the patient sitting up, and the surgeon supporting his foot upon the edge of his chair, or upon another chair standing close by. The operation is particularly applicable to dislocations in delicate females, and in old emaciated subjects. It is performed by inserting the knee as high as possible in the axilla, and then, the top of the shoulder being thoroughly steadied with the hand, carrying the elbow forcibly downwards and inwards towards the side of the body. This procedure is characterized by great simplicity, but wants the efficiency of the preceding.

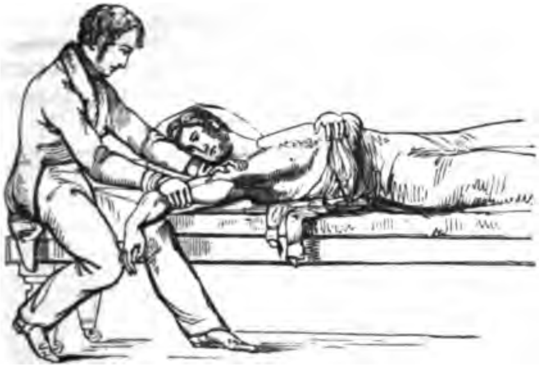
Fig. 40.



Reduction with the knee in the axilla.

Another method which may advantageously be employed is that devised by White, in the last century, and recently revived by Malgaigne. The patient lying upon his back, the surgeon stands or sits behind him, as in fig. 41, and raising the limb perpendicularly along the side of the head, he firmly fixes the shoulder, with one hand upon the acromion, while with the other he makes the requisite extension by pulling the lower part of the arm. In this way the luxated head of the bone is drawn directly upwards into the glenoid cavity.

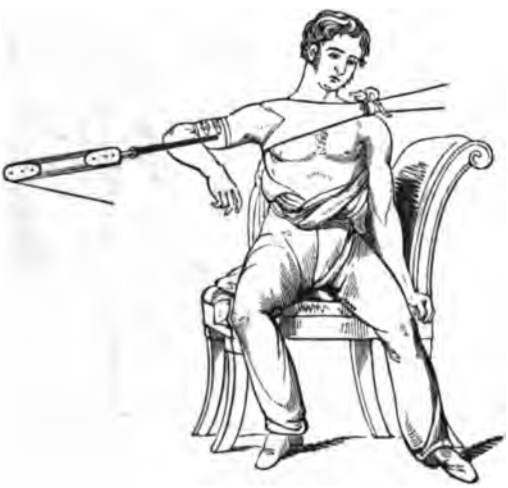
Fig. 41.



White's method of reduction.

Mr. Kirby, of Dublin, was in the habit of reducing this luxation by a method somewhat more complicated than any of the preceding, but not less efficient. The patient being seated upon the floor, a stout fillet was secured round the lower part of the arm, and confided to an assistant, while another assistant, also seated upon the floor upon the opposite side, steadied the scapula by encircling the chest with his arms, his fingers being interlocked in the axilla. When these preliminaries were arranged, the assistants carried each one leg behind and the other in front of the patient, so as to rest the soles against each other. The limb being now elevated nearly to a right angle with the body, the extension was made in a slow and gradual manner, while the head of the bone was urged upwards towards the glenoid cavity, the elbow being at the same time raised and brought towards the side.

Fig. 42.

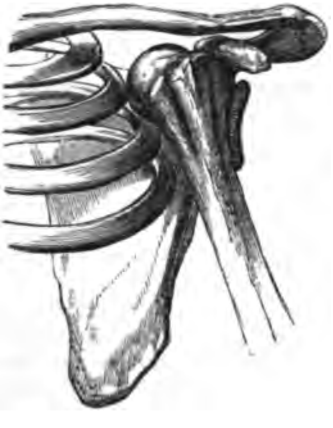


Mode of making extension with the pulleys.

I have never had occasion to employ the pulleys in recent dislocations of the shoulder, and can hardly imagine that they could be necessary even in very stout, muscular subjects, as any surgeon may with a little patience and skill effect reduction by the methods now pointed out with the aid of chloroform. Should a resort to the pulleys, however, be demanded, they must be employed with great care, lest harm should befall the axillary vessels; for the very fact that restoration cannot be accomplished by manual effort is an evidence of probable complication, and should be sufficient at least to put the surgeon on the alert. The operation is performed during the recumbency of the patient, or as he sits on his chair, as seen in fig. 42. The shoulder is firmly fixed by means of a long fold of muslin, the hand being passed through a hole in the centre, and its ends held by assistants, or fastened to a staple in the wall. The extending band is tied round the lower part of the arm, just above the elbow, and secured to the pulleys, which are then put in motion, the forces being applied transversely, and the head of the bone, as it approaches its socket, being lifted up by the hands in the axilla.

2. The *thoracic dislocation*, the subclavicular of the French surgeons, is comparatively rare, and is usually caused by violence applied directly to the head of the humerus, or to the elbow, when the arm is elevated, and carried behind the central line of the body. The bone is thrust to the sternal side of the coracoid process, just below the clavicle, resting against the second and third ribs, under cover of the pectoral muscles, as exhibited in fig. 43. The anterior and inner parts of the capsular ligament are extensively ruptured, and there is usually considerable injury sustained by the adjoining muscles, especially the subscapular, the infra-spinate, and the small teres, which are often severed from their attachments to the head of the bone.

Fig. 43.



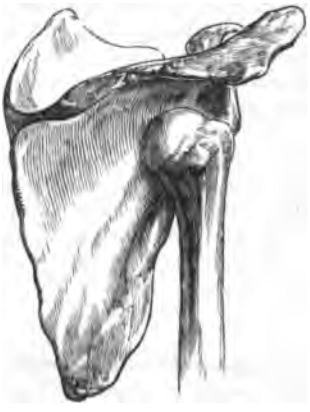
Dislocation of the humerus forward upon the chest.

The *signs* of this dislocation are usually well marked. The acromion juts out with great distinctness, the depression beneath it being much more conspicuous than in the axillary variety of the accident, in consequence of the manner in which the deltoid muscle is drawn over towards the chest; and the head of the humerus may generally be easily perceived just below the clavicle, forming a hard prominence which readily obeys the movements of the limb. The elbow stands off widely from the body, in a backward direction, and the arm is commonly shortened from half an inch to an inch. The pain is less severe than in dislocation into the axilla, as there is no compression of the axillary plexus, but the impairment of the functions of the joint is greater. The most important diagnostic marks are the peculiar attitude of the limb, the extraordinary prominence of the acromion, and the position of the head of the bone just below the middle of the clavicle, where it can generally be both felt and seen.

The *reduction* is easily accomplished by placing the heel in the axilla, so as to fix the scapula, and making the extension obliquely downwards and a little backwards, in the line of the displacement. The patient should lie upon the sound side, and as the head of the bone approaches the glenoid cavity it should be urged on by the pressure of the foot, at the same time that the arm is brought over to the body, very much as in the dislocation downwards. The chief impediments to the reduction are the supra and infra-spinate muscles along with the deltoid.

3. The *scapular dislocation* of the shoulder is an uncommon occurrence, and it is only within the last thirty years that its claim to a distinct variety has been fully recognized. One of the earliest cases of the kind with which I am acquainted happened in the practice of Dr. Physick, in 1811. A goodly number have since been reported by different surgeons; nevertheless, the accident is undoubtedly a rare one. It is generally produced by a fall upon the elbow or hand, the limb being at the moment raised, and stretched out in advance of the body, a movement which has the effect of slightly depressing the head of the humerus, and of throwing it backwards upon the posterior surface of the scapula, below the spine of that bone, as exhibited in fig. 44, and between the infra-spinate and small teres muscles. The inferior part of the capsular ligament is extensively opened, and the articular muscles are also generally seriously implicated in the mischief, their fibres being not only stretched, but often severely lacerated. It has been asserted that this luxation is always incomplete; but after a careful examination of some of the reported cases, I am satisfied that this opinion is incorrect.

Fig. 44.



Dislocation of the humerus backward upon the scapula.

The *symptoms* which characterize this luxation are sufficiently prominent. The rotundity of the shoulder is diminished, but not completely destroyed, the acromion is abnormally distinct, and the head of the humerus may be both seen and felt in its new position, at the posterior part of the shoulder, below the spine of the scapula. The arm is considerably shorter than in the natural state, and the forearm, strongly rotated inwards, is bent obliquely across the chest. The axilla is deprived of its fulness, and upon making firm pressure there, before there is any considerable swelling, the finger can be made to sink into the glenoid cavity. Supination of the limb is wholly impossible, and, indeed, all attempts at motion are productive of an unusual degree of pain and distress, owing to the manner in which the head of the humerus is impacted in its new position.

The *reduction* is effected by making extension and counter-extension in the usual way, and urging the head of the bone from behind forwards by means of the hand, until it can be perceived in the axilla, when the restoration is to be completed by bringing the arm gently downwards and backwards into a line with the body and a little in advance of it. The principal obstacles to the replacement are the supra-spinate, subscapular, large teres, and great pectoral muscles, which are generally powerfully on the stretch.

Reduction by Manipulation.—The different forms of dislocation now described may all be reduced by mere manipulation, especially in recent cases, although I believe that the heel in the axilla is, as a general rule, preferable to every other. In many instances simple torsion of the limb, particularly by rotation from without inwards, as recommended by Lacour, is quite sufficient for the purpose. The operation is performed by grasping the lower part of the forearm, and then turning the limb upon its axis, which has the effect of throwing the head of the humerus backwards and outwards, towards the glenoid cavity, when all that is necessary to induce it to slip into its proper position is to bring the limb on a line with the trunk.

In this country attention was first prominently directed to this subject by Professor Henry H. Smith. The manipulation, as practised by him, consists, first, in elevating the arm and flexing the forearm; secondly, in rotating the head of the humerus upward, outward, and backward, as far as possible, by using the forearm as a lever; and, lastly, in rotating the head of the bone strongly upward and inward by a reverse movement, while the elbow is brought to the side, the palm of the hand looking down, instead of up, as in the second stage of the proceeding.

When the head of the bone is thrown forward upon the chest, it must, as a preliminary step, be forced down into the axilla, by carrying the elbow as far back as possible, and then elevating it, when, rotation being properly executed, it will readily slip into the glenoid cavity. In the posterior luxation, the same object is attained simply by raising the arm and carrying it strongly forward.

The method of reducing dislocations of this joint by manipulation was warmly advocated, and rules laid down for its performance, by Sir Philip Crampton, as early as 1833, in a series of papers on the subject in the Dublin Medical Journal. In the luxation downwards he made gentle extension at the wrist to secure a long lever, and then slowly raised the limb to nearly a horizontal position, so as to relax the flexor and extensor muscles. He then suddenly pushed the arm upwards and a little forwards, towards the patient's face, or, in other words, rotated it inwards with the hand turned prone, and at the same instant forced the trunk suddenly backwards with the left hand placed below the axilla.

In the luxation forwards, "the surgeon," says Crampton, "should place his left arm, extended horizontally, immediately below the walls of the axilla, between the dislocated arm and the chest, and then, grasping the wrist in his right hand, he should draw the arm forcibly across the patient's body."

No anæsthetic need be administered in this mode of reducing dislocations of the shoulder, provided the manipulations are performed very slowly and gently, and the patient is not very muscular or rebellious.

General Diagnosis.—Although the diagnosis of dislocations of the shoulder-joint is usually sufficiently clear, cases occasionally occur where it is quite the reverse. There are several accidents with which they are liable to be confounded, from all of which it is of great importance that they should be correctly distinguished. Thus, mere contusion of the deltoid muscle, or a sprain of the articulation, sometimes simulates to a very perplexing extent the symptoms of luxation, by causing more or less obliquity of position of the arm, with inability to raise it; and the inexperienced practitioner is consequently liable to treat the case with improper severity, employing, perhaps, violent extension and counter-extension, when nothing but the most simple treatment is necessary. In general, however, the diagnosis is easily enough determined by a careful inspection of the affected joint. If there is no displacement, the head of the bone will be found to occupy its natural position, the shoulder to preserve its rotundity, and the arm to retain its natural length. Motion, too, will be found to be perfect if the patient is examined while under the influence of chloroform.

Great perplexity will be likely to arise when there is a fracture of the acromion, the neck of the scapula, or of the superior extremity of the humerus; hence, whenever such an occurrence is suspected, the surgeon cannot possibly be too much upon the alert. In each of these accidents there are three circumstances, which, if carefully considered, will always serve to prevent mistake. These are, preternatural mobility of the parts, crepitation, and facility of reduction, followed by an immediate recurrence of all the symptoms the moment the surgeon relinquishes his hold upon the limb. In dislocation, the head of the humerus is firmly fixed in its new situation, and is, consequently, moved with difficulty; there is complete absence of crepitation, or, if there is any noise of this kind, it is very faint, and entirely different from that which is caused by rubbing together the ends of a fracture; and, lastly, the restoration of the displaced bone can be effected only after much effort, generally, indeed, not without energetic extension and counter-extension. Moreover, the reduction being once effected, the articular surfaces usually retain their natural relations, having no disposition again to separate.

In fracture of the acromion, the outer extremity of the bone is drawn down by the action of the deltoid muscle, giving the shoulder a sunken appearance, and the arm is sensibly elongated and supported by the patient's hand. Restoration is readily effected by lifting up the elbow, but, upon abandoning our hold, there is an immediate reproduction of all the former symptoms, thus at once deciding the nature of the injury.

In fracture of the neck of the scapula, a very rare accident, the acromion retains its natural position, but is uncommonly prominent; the arm is elongated, and crepitation is easily elicited by raising the elbow, which will also have the effect of restoring the form of the joint.

The signs of fracture of the head and neck of the humerus are generally characteristic. The extremity of the bone, constituting the upper fragment, remains in its natural position, while the rough, angular end of the shaft projects upwards and inwards into the axilla, being drawn thither by the pectoral and dorsal muscles. There is no displacement of the acromion, the shoulder is less flattened than in luxation, and the arm, instead of being elongated or of the natural length, is materially shortened.

Complicated Dislocations.—Luxation of the shoulder is sometimes complicated with fracture of the acromion, the neck of the scapula, or the superior extremity of the humerus. Whenever such a coincidence obtains, the rule is to reduce the dislocation before we set the fracture, though the efforts at restoring the joint will generally be greatly promoted by putting up the limb temporarily in splints, as it will thus afford the surgeon a better leverage, which may be used with much effect in returning the luxated bone to its proper place.

Compound dislocations of the shoulder-joint are rare in civil practice. When the head of the humerus is forced through the soft parts, no time should be lost in restoring it to its natural position, provided it has not sustained any serious detriment, in which case it should promptly be excised, so as to afford the patient a better chance of recovery.

Laceration of the axillary artery, followed by a diffused aneurism, sometimes complicates this accident. The prominent symptoms are, cessation of pulsation at the wrist, and the sudden formation of a large tumor in the axilla. The proper plan is to reduce the dislocation, and then to ligate the artery above and below the seat of rupture. Dr. J. C. Warren was compelled to tie this vessel on account of an enormous aneurism, the result of injury inflicted by the operator's boot in an effort to effect replacement in a case of recent dislocation.

Anomalous Dislocations.—Of the rare displacements of the shoulder there are several varieties, of which the best known is the one originally described by Sir Astley Cooper as a *partial luxation* of the head of the humerus, the bone lying upon the anterior part of the neck of the scapula, underneath the coracoid process, being thrown off from the glenoid cavity inwards and slightly downwards. Malgaigne has more recently given an account of it under the name of the *subcoracoid* dislocation. The accident is exceedingly uncommon. It is caused by a violent fall upon the hand or elbow, at a moment when the limb is carried backwards beyond the line of the body and a little away from the side. The anterior part of the capsular ligament is ruptured, but the muscles and tendons round the joint sustain comparatively little injury, as they are subjected to much less tension than in the complete luxations of the shoulder.

Some diversity of opinion exists as to whether this dislocation should be considered as a partial or as a complete one; some contending that the head of the humerus does not entirely abandon the glenoid cavity, while others assert that it does. Without positively denying that the latter occurrence is impossible, I am strongly inclined to believe that the displacement can seldom be complete, on account of the check offered by the coracoid process to the progress of the bone as it is being impelled downwards and inwards. In the case described by Sir Astley Cooper, which was one of long standing, and the only one, I believe, that has ever been examined after death, a new articular cavity was formed in the subscapular fossa, but not completely outside of the glenoid cavity, showing that the latter had not been wholly abandoned by the head of the humerus.

The *symptoms* of this dislocation are not so well marked as in the complete varieties. It is only in very thin subjects that the head of the humerus can be very distinctly perceived in its new situation, or felt rolling about upon rotating the limb. The deltoid is less flattened than ordinary, and the hollow below the acromion is also much less, the extremity of the process not standing out so conspicuously. The elbow is carried backwards and slightly away from the side, and all attempts to elevate it are found to be abortive, in consequence of the head of the humerus hitching against the coracoid process. The limb is generally represented as being a little shortened; if this be so, the change must be very slight, and can be of no diagnostic value.

The *reduction* is effected upon the same principles as in the other forms of displacement; but in this case it is necessary to make the extension, at first, more in the line of the luxation, in order to disengage the head of the humerus from the neck of the scapula.

Dr. Willard Parker, in 1852, described a case of luxation of the shoulder-joint, in which the head of the humerus was thrown into the *subscapular fossa*. The accident happened while the patient, a young man aged twenty, was at work in a woollen factory, his right arm being caught between the belt and drum, and violently rotated outwards, while the machinery was in rapid motion. When the limb was liberated, it was found lying diagonally across the body, in a state of strong, fixed pronation; the rotundity of the shoulder was lost; and the head of the bone could be distinctly felt beneath the scapula. The reduction was effected by carrying the arm outwards at a right angle with the body, and then pulling the hand and wrist, so as to force the head of the humerus into the axilla, whence it was afterwards easily raised into its proper situation.

Larrey has described a preparation in the medical museum at Vienna, in which the head of the humerus had penetrated the chest, through the third rib, so as to form a tumor within its cavity. The accident has been produced by a fall upon the elbow, which was at the moment separated from the side of the body.

In a case reported by Laugier, the bone was turned directly forwards, resting against the outer margin of the coracoid process. The great tuberosity corresponded to the glenoid cavity, and the limb had a remarkably twisted appearance.

Double Dislocations.—Finally, there is occasionally a simultaneous dislocation of both shoulder-joints. Such an accident, however, of which interesting cases have been reported by W. H. Van Buren, Geddings, and others, is exceedingly uncommon. The head of each bone is generally forced down into the axilla, or one occupies this situation and the other the chest beneath the pectoral muscles. The dislocation, which is sometimes complicated with fracture of the scapula and humerus, is usually caused by a fall, in which the person stretches out both hands to save himself from injury. In a case treated by Ballingall, the accident occurred during an epileptic fit; and in another, recorded by Nathan Smith, in an attack of puerperal convulsions.

The reduction in the double dislocation is effected upon the same general principles as in the single variety. In Smith's case, just referred to, replacement is said to have been effected at the end of seven months. In a case recorded by Fischer, the patient, a stout, athletic man, restored the parts to their proper position by his own efforts. Seating himself upon a high bench, he seized, simultaneously with both hands, a transverse beam above his head, and, throwing himself suddenly and forcibly from his seat, both bones instantly slipped into the glenoid cavities with a crackling noise. In Van Buren's case, the man died in five hours after the accident from injury of the skull and brain.

After-treatment.—The after-treatment of dislocations of the shoulder requires particular attention. In the first place, it is highly important to guard against a recurrence of the accident, which is so liable to happen after all injuries of this kind, especially after luxation into the axilla. Generally, all that is necessary for this purpose is to support the elbow, forearm, and hand for some time in a sling close to the side of the body; or, if the patient is restive, the arm may be secured to the trunk, over a small pad, by six or eight turns of a bandage. Full elevation, abduction, and rotation of the limb should not be permitted for five or six weeks, or until there is reason to believe that the capsular ligament and muscles have been in great degree repaired. The resulting inflammation is treated upon general principles. Passive motion, the cold douche, and liniments will be required to prevent anchylosis.

Accidents.—Dislocations of the shoulder are sometimes followed by *paralysis* of the deltoid muscle, from injury done to the circumflex nerve by the head of the humerus. Occasionally the axillary plexus suffers very seriously, and then the paralysis may be much more extensive, involving, perhaps, the whole arm, as in two cases reported by Professor Dugas. When the lesion is slight, it may get well spontaneously, or with the aid of stimulating liniments, veratria ointment, and counter-irritation, especially vesication; but in its more severe forms, as when it depends upon contusion and partial disorganization of the nerves, it often proves very refractory, and may even be incurable.

Another unpleasant effect which now and then succeeds dislocations of the shoulder, is *œdema* of the corresponding extremity, arising from the pressure of the head of the humerus upon the axillary veins and lymphatics; this, however, rarely lasts beyond a few days, and generally disappears spontaneously or under very simple means.

A sudden development of *emphysema*, first noticed by Desault, is sometimes met with after this accident, and is well calculated to create unpleasant apprehensions in the mind of the attendant. Its cause has not been satisfactorily accounted for, but it is reasonable to suppose that it can be nothing else than a slight wound of the chest, from fracture of a rib, penetrating the pleura and lungs. This idea is countenanced by the circumstance that the starting-point of the emphysema is always under the pectoral muscles, from which it rapidly spreads to the axilla, the whole of which it soon occupies. It may readily be distinguished from an extravasation of blood, consequent upon rupture of the axillary artery, by its elasticity, by the continuance of the pulse at the wrist, by the natural appearance of the skin, and by the production of a crackling noise when the part is pressed with the finger. Astringent lotions and gentle compression are the proper remedies.

Finally, the accident is sometimes attended with *rupture of the axillary artery*, leading to copious infiltration of blood, or, when the lesion affects only the inner tunics of the vessel, to the formation of a false aneurism. In either case, of the latter of which a remarkable one has been recorded by Nélaton, the proper treatment, after the reduction of the luxation, would be the ligation of the subclavian. Bérard met with an instance of subcoracoid dislocation in which there was no pulsation at the wrist after the accident; several of the fingers were attacked with gangrene, and the patient died. The internal coats of the axillary artery were torn across in their entire circumference, and the cellulo-fibrous one greatly stretched.

Chronic Dislocations.—Chronic dislocations of the shoulder are often brought under the notice of the surgeon, and the question therefore arises, at what period after their occurrence should he refrain from an attempt at reduction? Upon this subject I do not think it possible to lay down any definite rules. I have myself been foiled at the end of the sixth week, and I have known the same thing to happen to several practitioners of great skill and experience. On the other hand, I have succeeded, in one case, at the seventy-second day, and in another at the expiration of the third month. Physick succeeded in a number of instances after two and three months; and examples of from four to seven months' standing have been reported by McKenzie and Jameson, of Baltimore, Dorsey and Gibson, of this city, and by other American surgeons. Dr. Nathan Smith effected reduction in one case nearly one year after the occurrence of the accident. Keppell is said to have succeeded at the end of fourteen months, and Dieffenbach at twenty-four, not, however, without the extensive division of the capsular ligament and adjoining muscles. These instances are certainly very encouraging, but they should, nevertheless, be received with great caution, especially when it becomes necessary to view them as examples for our imitation. It should not be forgotten, as stated elsewhere, that the greatest possible differences prevail in regard to this subject; that in one case a dislocation may become irreducible in several weeks, and in another not under several months, depending upon the individual circumstances of each.

Perhaps the best plan that can be adopted in these chronic cases is to be guided by the degree of motion that has been acquired by the luxated bone. When this is considerable, it may be assumed that it has succeeded in establishing for itself a new joint, which it might be dangerous to disturb on account of its important relations with the surrounding parts. Another consideration which should have its weight is the amount of inflammation by which they are followed; if this has been unusually violent, it may be inferred that there has been copious plastic effusion, filling up the original socket, and causing extensive adhesions among the muscles and vessels, matting them firmly together, and rendering interference hazardous.

When it is thought advisable to attempt reduction, the rules already laid down in the opening section upon dislocations, must be carefully observed; that is, a certain amount of preliminary treatment should be instituted with a view of facilitating the breaking down of the abnormal adhesions between the head of the displaced bone and the surrounding parts, and thus lessening the danger both of failure and of injury to the axillary vessels and nerves, after the application of the extending and counter-extending forces. In general, a resort to the pulleys will be required, and, in some cases, the apparatus of Dr. Jarvis might possibly be advantageously used.

Notwithstanding the greatest care that can be exercised in these operations, the result is not infrequently most disastrous. The accidents that are most liable to occur are, severe contusion of the soft parts, fracture of the humerus, and laceration of the axillary artery. A number of instances have been related in which death was produced either by shock or by the severity of the resulting inflammation.

The skin and muscles must often, of necessity, be much bruised, and the latter sometimes even partially lacerated, in these operations. The occurrence may be brought about simply by the long-continued pressure of the heel in the axilla, or by the use of special apparatus, and is not unfrequently attended with extensive abrasions of the surface and more or less infiltration of blood in the connecting cellular tissue of the axilla and side of the chest.

The *axillary artery* has been ruptured in a considerable number of instances, and the result, in nearly all, has been promptly fatal. The disastrous cases recorded by Loder, Cooper, Pelletan, Flaubert, Bell, Gibson, and others are well known to surgeons, and should serve as warnings in regard to rude and protracted interference in accidents of this kind, sometimes even when they are not of long standing. That such an occurrence should happen is not at all singular when it is recollected how liable dislocations of the shoulder are to be followed by severe inflammation and copious deposit of lymph, firmly gluing the axillary artery to the surrounding parts, and thus necessarily endangering it in any forcible attempts that may afterwards be employed to restore the head of the humerus to its natural position. The necessary result of such an injury is, of course, an aneurism, generally of a diffused nature, and characterized by the ordinary phenomena, as the sudden formation of a tumor in the axilla, and the cessation of pulsation at the wrist.

The *axillary vein* has sometimes been lacerated. Froriep has related an instance of this kind in a woman twenty-six years old. The axilla became suddenly enormously distended with blood, and death occurred in an hour and a half. The dislocation had existed only twenty days.

A number of instances of laceration of the *axillary nerves* have been reported as having occurred in attempts to reduce old dislocations of the shoulder. The accident is necessarily followed by more or less paralysis of the superior extremity. A more common effect is severe contusion of these cords, with pain and œdema of the limb, and temporary impairment of function.

Fracture of the humerus has occurred in the hands of some of the most distinguished surgeons. The portion of bone most liable to give way is the surgical neck, and the accident always happens during the violent efforts that are made to force the head of the humerus out of its abnormal position while the arm is pressed forcibly across the chest, the strain thus produced being concentrated at its superior extremity. The occurrence is generally indicated by a loud noise or snap.

It is not improbable that in a very old person, the *ribs* might be fractured in efforts of this description by the pressure of the heel in the axilla or by the use of Jarvis's adjuster. I am not aware, however, that any cases of such a nature have been recorded.

The proper treatment of these several occurrences will readily suggest itself. When the axillary artery is ruptured the best plan is at once to expose it by a free incision, and to ligate it at each extremity, as in aneurism of a similar nature in other parts of the body.

Congenital Dislocations.—Congenital dislocation of the shoulder-joint is sometimes observed. The accident has been particularly studied by Mr. Robert W. Smith, who directed special attention to it in his excellent work on fractures, published in 1847. Since then it has been examined with much care by Gaillard, Guérin, Nélaton, and others.

The malposition may be single, or double, and cases occur in which it coexists with similar displacement in other articulations. Only two varieties have hitherto been recognized by dissection, termed, by Mr. Smith, the subcoracoid and the subacromial, the head of the humerus in the former being lodged beneath the coracoid process, and in the latter on the dorsal surface of the scapula, below the outer and posterior part of the acromion. The latter might, perhaps, more properly be called the infra-spinous form of the luxation.

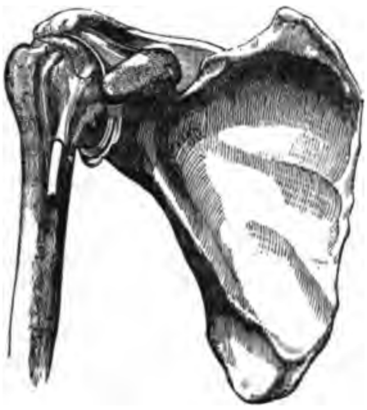
The symptoms of both these dislocations are well marked. In the *subcoracoid* variety, the shoulder has a flattened appearance, especially at its upper and posterior aspect, the acromion is unnaturally sharp and prominent, there is a remarkable hollow in the supra-spinous fossa, and the head of the humerus may readily be felt beneath the coracoid process, forming a distinct ball, which promptly obeys the movements of the elbow. The arm, which hangs along the side, is greatly withered, thus singularly contrasting with the forearm and hand, which generally retain their full development, being in fact quite as well-conditioned as the opposite limb. The movements of the scapula are perfectly normal, while those of the arm are either annulled, or very much impeded, especially abduction; the forearm can be bent, but not actively extended. The movements, on the contrary, of the hand and fingers are nearly, if not entirely, natural.

In the *subacromial* dislocation the head of the humerus may easily be felt on the dorsum of the scapula, a short distance below the root of the acromion, where it forms a distinct, unmistakable prominence. The deltoid muscle is flattened externally and in front; the acromion is uncommonly salient; the arm, shortened and withered, is rotated inwards towards the trunk; and the forearm and hand are slightly pronated, supination being executed with great difficulty.

The *treatment* of these dislocations must be conducted according to the general principles laid down in a previous page. In a remarkable instance, Gaillard succeeded in effecting the reduction of a congenital luxation of the shoulder-joint in a girl sixteen years of age, who recovered with a most excellent use of the arm. For several weeks prior to the operation, the parts were daily subjected to passive motion and manipulation, so as to induce them to yield the more readily to the necessary extension and counter-extension. The inflammatory symptoms that followed the reduction were combated by the usual means.

Dislocations of the Tendon of the Biceps.—The tendon of this muscle is liable to be dislodged, by being violently wrenched from its bed in the humerus, and perhaps partially torn, if not completely snapped asunder. In the latter case, the upper extremity of the tendon may float loosely about within the joint. The accident generally happens from falls or blows upon the shoulder, forcing the humerus away from the glenoid cavity of the scapula, generally upwards and inwards against the coracoid process, or forwards against the ribs. The accident may also occur from falls on the hand or elbow, especially if, at the moment, the limb is very much twisted upon its axis. The nature of the lesion is always obscure, and therefore very apt to be overlooked, or to be mistaken for dislocation, fracture, or sprain of the shoulder. The most prominent symptoms are, inability to flex the arm from the loss of power in the biceps, and pain at the seat of the injury, either alone, or united with partial displacement of the head of the humerus. Reduction should be attempted by thorough relaxation of the muscle by bending the forearm at a right angle with the elbow, and then pressing the tendon back into its proper place with the fingers. The after-treatment should be strictly antiphlogistic; otherwise there will be great danger of permanent anchylosis of the joint. If the tendon is completely severed, the limb will always be weak. In the adjoining drawing, fig. 45, from a preparation of Mr. Sodon, the tendon of the muscle lay with its sheath on the lesser tubercle of the humerus.

Fig. 45.



Dislocation of the tendon of the biceps muscle.

3. INFERIOR EXTREMITY.

DISLOCATIONS OF THE FOOT.

Luxations of the *phalangeal* and *metatarso-phalangeal* joints are uncommon, and are mostly of so complicated a character as to require amputation. The reduction is always easy.

Of dislocation of the *great toe* at the metatarsal joint, a very infrequent accident, I have seen two cases, one recent and the other old. The following is a brief history of them.

A gentleman, aged forty-two, while walking along the pavement, slipped with his right leg through the hole of a cellar. The dorsal surface of the foot striking against a lump of coal, bent the great toe downwards and dislocated it at the metatarso-phalangeal articulation. The accident was productive of considerable pain, and was so well marked as to be at once recognized. The toe was inclined somewhat outwards, and lay a little higher than in the natural state. It was fully half an inch shorter than the sound one. The head of the first phalanx rested upon the dorsal surface of the anterior extremity of the metatarsal bone, where it formed an abrupt, well-defined prominence. The projection on the plantar surface, formed by the head of the metatarsal bone, was less conspicuous. The adductor muscles of the great toe formed a broad, tense cord at the inner side of the foot, which disappeared on the reduction, having been caused by the retraction of the toe. I saw the man within an hour after the accident, when there was no swelling or discoloration of the parts.

The patient being placed under chloroform, I applied a clove-hitch knot to the toe, and readily drew it into place, the extension being made forwards, and slightly downwards, to disengage the head of the phalanx from the anterior extremity of the metatarsal bone. The foot was steadied by an assistant grasping the ankle.

In the other case the accident was occasioned by the foot being caught between two steamers, which twisted off the man's boot, severely wrenching the limb, and bruising the soft parts. The phalanx of the big toe was forced below the metatarsal bone, forming a large prominence in the sole of the foot, which has ever since, now a period of six years, been a source of much annoyance, being frequently so sore and tender as to interfere materially with progression.

The *reduction* of this luxation is occasionally attended with considerable difficulty, depending probably upon the manner in which the adductor muscle and the sesamoid bones are dragged by the displaced phalanx backwards over the extremity of the metatarsal bone. In the event of such a contingency, I should endeavor to effect restoration by means of Dr. Crosby's plan of reducing dislocations of the thumb, raising the toe perpendicularly, and then applying strong pressure against its base, so as to push it from behind forwards, and from above downwards.

The *metatarsal* bones are rarely dislocated, owing to the firmness of their connections both with each other and with the lower row of tarsal bones. The accident is most commonly compound. A simple luxation, however, of one or more of these bones is sometimes occasioned by a violent wrench of the foot, or by the passage of the wheel of a carriage, as happened to me in a case many years ago, in which the fourth and fifth metatarsal bones were detached from their connections with the cuboid bone, and thrown upwards upon the tarsus. The reduction was effected with great facility, and, under the employment of leeches and other antiphlogistics, the man was able in the course of a fortnight to exercise on crutches, regaining eventually a good use of his limb.

The only case of a complete dislocation of all the metatarsal from the tarsal bones of which I have any knowledge, was communicated to me in 1857, by Dr. Traill Green, of Easton, Pennsylvania, as having occurred under his observation and that of Dr. Edward Swift. The patient, a medical gentleman, aged sixty-five, had fallen down a flight of stairs, injuring the left foot, which was found soon after the accident to be much swollen over the arch and very painful, with deformity at the inner and outer edge. The metatarsal bone of the great toe was separated from the internal cuneiform bone, and thrown over towards the outer margin of the foot, leaving the latter bone quite prominent at the inner side. A similar condition existed on the opposite side, the metatarsal bone of the little toe being thrown off completely from the cuboid bone, so as to present a well-marked projection at the outer border of the foot. In short, the twisted state of the foot, the great deformity, and the swelling of the arch, clearly indicated a lateral displacement of all the metatarsal bones.

The *reduction* was easily effected. The patient being placed in a half reclining posture on a settee, with his right foot against the arm to brace himself during the operation, an assistant applied his knee to the instep, and while he made extension by grasping the dislocated portion of the foot, previously surrounded by a wet roller, to prevent the lac from slipping, Dr. Green, who supported the leg upon his thigh, made strong lateral pressure, in a direction contrary to that of the displacement. The parts soon began to yield, and in a few minutes returned to their proper place with a distinct snap, all deformity at the same time disappearing.

Dislocation of the *tarsal* joints is uncommon, their limited motion and the strength of their ligaments disqualifying them for disunion. The astragalus is almost the only bone which is liable to displacement, and this accident is also unusual.

Dislocation of the *cuneiform* bones is extremely infrequent. The internal one is most liable to suffer. The accident is usually caused by falls from a considerable height, in which the person alights upon the sole of the foot, the force separating the bone from its natural relations. A projection on the inside of the foot, and a slight elevation of the bone, from the action of the anterior tibial muscle, are the characteristic signs of the lesion. The reduction, which is difficult, is effected mainly by pressure. In two cases of this luxation mentioned by Sir Astley Cooper, replacement was found to be impracticable. In general, when this happens, the patient, in time, regains a tolerably good use of the limb.

Retention is maintained by adhesive strips, a compress, and bandage, aided by splints, to keep the foot in a quiet, easy position. When the inflammation has sufficiently subsided, a leather strap with a soft pad should be worn, to protect the parts until the reparative process is completed.

The *scaphoid* and *cuboid* bones are occasionally separated from their connections with the astragalus and calcaneum, in consequence of the falling of a heavy weight, or of a person jumping from a considerable height and alighting upon the sole of the foot. Under these circumstances the foot is shortened and twisted upwards and inwards, forming a remarkable prominence upon the instep, which gives it a distorted appearance not unlike what occurs in varus. The accident is extremely infrequent, and is easily remedied by fixing the leg and heel, and then drawing the toes outwards, in a direction contrary to that of the displacement. Suitable retentive means will, of course, be required to prevent a recurrence of the luxation.

The *calcaneum* has been found dislocated from the cuboid bone laterally, in an outward direction, from causes similar to those producing displacement of the other tarsal bones. The accident is easily detected and remedied by manipulation.

A remarkable instance of dislocation of the five anterior *tarsal* bones from the astragalus and calcaneum has been recorded by Sir Astley Cooper, as having occurred in a laboring man, from the fall of a very heavy stone. The foot was singularly distorted, exhibiting very much the appearance of club-foot, the forepart being turned inwards upon the astragalus and calcaneum, so as to give the limb an arched shape. The reduction was easily effected by fixing the leg and heel, and pushing the luxated bones in a direction contrary to that of their displacement. A similar case has been recorded by Petit.

In the succeeding pages an account will be given of luxations of the *astragalus* from the mortise-like cavity of the tibia and fibula, and, without anticipating, in any way, what will then be said, it is important to bear in mind that the class of lesions which is now to be considered is very different from that of the ankle-joint, in which the bone in question plays so conspicuous a part. In the latter affections the astragalus is torn off simply from its connections with the tibia and fibula, but in those which are next to be described, it not only loses its relations with these bones, but also with the calcaneal and scaphoid bones. The displacement may either be partial or complete, the astragalus in the former case still retaining some of its connections, whereas, in the latter, they are entirely lost, complete disruption having taken place, or, in other words, the bone is lifted bodily out of its original position into one altogether new. It is obvious that such an accident can only occur from the application of excessive violence, in which the foot is strongly extended upon the leg, and more or less rotated upon its axis. Hence it is always of a grave nature, and rarely unaccompanied by fracture of the inferior extremity of the tibia and fibula, which thus adds still further to its complications and dangers. Occasionally, indeed, the astragalus itself is severely shattered.

Dislocation of the astragalus may take place in two directions, backwards and forwards, the latter, which is by far the more frequent, admitting also of a certain degree of displacement laterally, or to either side, in consequence of a twist of the foot. In the posterior luxation the bone does not experience any rotation; hence it is more in the course of the median line, suffering no material lateral deviation.

In the luxation *backwards*, of which only a few cases are known as having occurred, the astragalus is thrown behind the ankle, resting upon the superior surface of the calcaneum, where it forms a large characteristic prominence. The tendo Achillis is pressed strongly backwards by the displaced bone, there is great tension of the skin of the heel, the muscles of the calf are very rigid, the tibia is slightly pushed forwards, and the instep appears a little shorter than natural.

In general, also, there is a slight vacuity in front of the joint. The tibia and fibula are sometimes both fractured.

The *reduction* of this luxation is attended with extreme difficulty, owing to the manner in which the surfaces of the astragalus and calcaneum are interlocked with each other, and I am not aware that the operation has ever succeeded, except in one case, which occurred to Mr. Liston, and in which the accident was attended with fracture of the tibia and fibula, which had probably the effect of rendering the parts more movable. In attempting to replace the bone, the leg and foot should be as strongly flexed as possible, so as to induce thorough relaxation of the gastrocnemial muscles, and then, while extension and counter-extension are made by means of the clove-hitch, the astragalus should be urged from behind forwards into its natural position. When the difficulty is very great, the parts absolutely refusing to yield to any efforts, however judiciously applied, recourse should be had to the subcutaneous section of the tendo Achillis, in the hope of promoting thereby restoration. The operation has recently succeeded in quite a number of cases.

When reduction fails, the patient will in time acquire a tolerably good use of his limb, the parts accommodating themselves gradually to their new relations. In one instance, where the attempts proved unsuccessful, the bone caused sloughing of the soft structures, and was obliged to be extracted.

The luxation *forwards* is generally incomplete, the anterior half of the bone, or a little more, resting upon the dorsal surface of the scaphoid bone, while the posterior half is imbedded in the hollow between the two articulating surfaces of the calcaneum. The displaced bone forms a distinct prominence over the instep, while a marked vacuity exists at the inner part of the foot, just below the corresponding malleolus. The tibia and fibula either retain their natural position, lying upon the posterior surface of the astragalus, or, as more commonly happens, they are carried slightly forwards, thus increasing the length of the heel, and inclining the foot towards one side or the other, according to the peculiar relations which the bone may sustain towards the calcaneum, a trifling change of position being capable of determining the nature of the lateral displacement.

In the complete form of the accident, the bone is forced away entirely from its natural position, being tilted up in front of the joint so as to rest upon the scaphoid and cuneiform bones. The signs are characteristic, the large prominence at the instep, the constrained and twisted position of the foot, the shortening of the leg, and the descent of the malleoli towards the sole of the foot, together with the elevation and lengthening of the heel, being sufficient to reveal its nature at a glance.

Sometimes the position of the astragalus is almost completely reversed, and there are few cases which are unattended with fracture of the tibia and fibula, or even of the astragalus itself. Moreover, the dislocation is not infrequently of a compound character, the soft parts being severely lacerated, and the wound extending into the ankle and tarsal joints; or, when such an effect has not been the direct result of the accident, the foot is soon reduced to that condition by the ulceration and sloughing caused by the pressure of the displaced bone upon the integuments of the instep.

The great obstacle to *reduction* in this as in the backward dislocation is the malposition of the astragalus, or the change in its axis, which not infrequently baffles all the efforts of the surgeon at restoration, however well directed or perseveringly continued. Even when the displacement is only partial, the difficulty will generally be very great, though not as much so as in the complete form, in which it is usually insurmountable. In the latter case, indeed, it is questionable whether, after what experience has taught us upon the subject, it will be judicious hereafter to make any efforts at reposition, seeing how much all such trials, rough and protracted as they necessarily must be, must tend to aggravate the injury, and thus increase the risk of undue inflammation. When the displacement is partial, I would certainly strongly urge the employment of reductive means, consisting of traction and pressure, aided, if the case prove rebellious, by the subcutaneous section of the tendo Achillis and any ligaments that may seem to act obstructingly. When replacement is impracticable, the tension of the parts should be relieved by subcutaneous incisions, as this will lessen the risk of sloughing and exposure of the bone; a circumstance inevitably productive of necrosis, and the necessity of partial excision. When such an accident can be prevented, it is consoling to know that, as in the dislocation backwards, the bony surfaces become gradually adapted to each other, thereby ultimately permitting a tolerably good use of the limb.

When the bone is entirely displaced, lying immediately beneath the integuments and muscles of the instep, the only safe procedure is immediate excision, the ends of the tibia and fibula being placed in the sulcus vacated by the removal of the astragalus, and the edges of the wound being carefully approximated by collodion, so as to insure their prompt reunion without risk of suppuration. Statistics strongly testify in favor of this plan of treatment. Thus, of fifty-two cases analyzed by Broca, forty-two terminated successfully. The operation, however, is not always free from difficulty, as is exemplified in an instance recorded by Dupuytren, in which the bone was extirpated only after a long and tedious dissection, owing to the pulley-like surface of the astragalus being turned downwards, while its posterior projecting part was hooked in under the tibia. Only about one person in four recovers with ability to move the ankle.

In *complicated* dislocations a similar procedure is proper; but here, if the injury is at all grave, the question of amputation will necessarily arise, and much judgment will generally be required to make a just decision. In all severe cases, involving extensive lesion both of the soft structures and of the bones, especially when occurring in weakly or sickly subjects, no experienced surgeon would for a moment hesitate as to the propriety of removing the limb; the only doubt that could possibly arise would be, whether the operation should be done through the leg or through the foot, according to Pirogoff's method.

The *after-treatment* of these cases requires no special mention. The great points are to give due support to the limb, and to moderate the resulting inflammation by the bandage, leeches, and medicated lotions; and, eventually, by the institution of passive motion, to prevent union between the calcaneum and the bones of the leg. If erysipelas should appear, as in severe cases it is very prone to do, early and free incisions will be necessary.

DISLOCATIONS OF THE ANKLE.

Dislocations of the ankle-joint are among the most infrequent of traumatic lesions, the mechanism of the articulation being eminently unfavorable to their occurrence. The length and width of the malleoli render lateral displacement of the astragalus almost impossible without concomitant fracture of one or both of these projections, while luxation in the antero-posterior direction is nearly as impracticable in consequence of the extraordinary strength and firmness of the ligaments connecting that bone to the tibia and fibula. The effect is that these injuries are almost always of a complicated character, their chief interest depending upon the violence done to the neighboring structures. Most of them, in fact, should be viewed in the light rather of fractures of the tibia and fibula, with displacement of the astragalus, than as dislocations, properly so called, of the ankle-joint. After a very careful examination of the records of surgery, I find that simple displacement of this bone, in any direction, is an occurrence of such extreme infrequency as hardly to deserve mention.

The dislocations of the ankle-joint are four in number, the foot being susceptible of being thrown forwards, backwards, inwards, and outwards. In addition to these displacements a few cases have occurred of luxation of the astragalus upwards, this bone having become wedged in between the lower extremities of the tibia and fibula; and Huguier has published the particulars of one where the foot was turned completely outwards, the toes forming a right angle with the leg, and the external malleolus representing the heel.

The nomenclature of these luxations has been the subject of a singular caprice, and, in consequence, the result of no little confusion. Instead of considering the astragalus as the dislocated bone so as to place this joint in the same position, in this respect, as the other articulations, Sir Astley Cooper and others, adopting his example, have made it the fixed point and the tibia and fibula the movable. This manner of viewing these lesions has occasioned a corresponding change of nomenclature, and as both are radically defective, serving only to embarrass the progress of the student, they should be discarded.

1. Luxation *forwards*, the most infrequent of all, arises from falls on the heel, while the foot is forcibly bent upon the leg, the body being at the same time inclined forwards, so as throw the strain upon the forepart of the joint. Under these circumstances the ligaments are extensively ruptured, and the astragalus, escaping from the mortise-like cavity of the tibia and fibula, rests immediately in front of the former bone, where it forms a large projection, readily perceptible just beneath the integuments. The diagnostic signs are, the elongated state of the foot, the distance between the leg and toes being materially augmented, the remarkable shortening of the heel, and the effacement of the depressions behind the ankle from the close approximation of the tendo Achillis to the posterior surface of the limb.

The *reduction* is effected mainly by manipulation. As a preliminary step, the leg is flexed at a right angle with the thigh, to relax the gastrocnemial muscles, when an assistant, seizing the lower part of the leg, gradually pushes it forwards, while the surgeon, grasping the foot, and bending in considerably, forces it backwards, in the opposite direction. When the case is rebellious, recourse may be had to the subcutaneous division of the tendo Achillis, which greatly facilitates restoration.

2. Dislocation of the ankle-joint *backwards* is caused by violence applied to the anterior extremity of the foot while it is immoderately extended, the knee being at the same time strongly flexed and projected forwards; or, the foot and leg being in this position, it may arise from a severe blow upon the lower and back part of the limb, the two forces driving the articulating surfaces in opposite directions. The displacement is ordinarily accompained by fracture of the inferior extremity of the fibula.

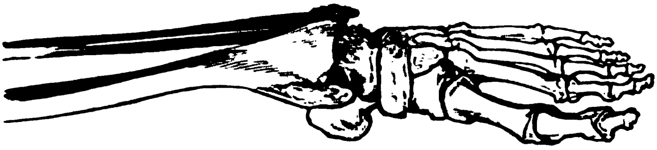
The *signs* are characteristic, being the reverse of those which distinguish dislocation forwards. The dorsal surface of the foot is shortened, the toes pointing downwards; the heel is elongated and firmly fixed; the tendo Achillis, pushed far back beyond its natural position, stands out in bold relief; the pulley-like surface of the astragalus is readily perceptible at the back part of the inner ankle; and the extremity of the tibia forms a hard prominence upon the instep, immediately beneath the integuments.

The restoration is accomplished in the same manner as in the luxation forwards, the gastrocnemial muscles being thoroughly relaxed, and the bones pulled and pushed in opposite directions.

The dislocation backwards is sometimes *incomplete*, one-half of the articular surface of the tibia resting upon the scaphoid bone and the other half upon the astragalus. The foot, pointed downwards, cannot be put flat upon the ground, and the heel is raised and abnormally prominent, but less so than in complete luxation. A careful examination of the joint will at once reveal the true nature of the case.

3. Luxation *inwards*, which is the less frequent of the lateral displacements of the ankle-joint, is generally occasioned by falls or blows upon the foot, in

Fig. 46.



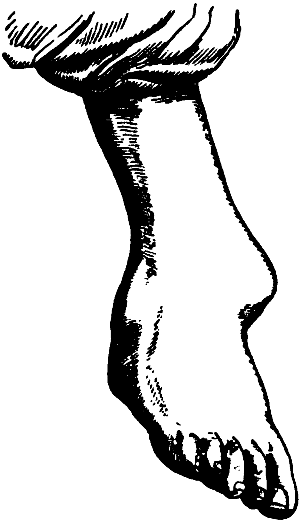
Dislocation of the tarsus inward.

which the astragalus is violently rotated upon its axis, and thrust against the inner malleolus, which is usually broken in consequence, being separated obliquely from the extremity of the tibia, as exhibited in fig. 46. It is also liable to be produced by direct injury, as that caused by the passage of the wheel of a carriage. Sometimes the luxation is associated with fracture of the astragalus, or of this bone and the fibula, thus greatly aggravating the case.

The articular surface of the astragalus, pointing immediately below the internal malleolus, can easily be perceived in its new position; the foot is turned inwards, its outer border resting on the floor, while the inner is proportionately raised; and there is a remarkable prominence at the outer part of the joint, formed by the extremity of the fibula.

In reducing this dislocation, the leg is bent at a right angle with the thigh, and steadied by an assistant, while traction is made upon the foot, and the astragalus pushed back into its natural position. Apposition of the articular surfaces is maintained by means of two side-splints, or, what I prefer, by a tin-case, well fitted to the size and shape of the limb, it being all important to afford the foot proper support until repair has taken place.

Fig. 47.



Dislocation of the tarsus outward.

4. Dislocation *outwards*, fig. 47, is the most frequent of all the displacements to which this articulation is exposed, a sudden twist of the leg, while the foot is firmly fixed, being the most common exciting cause, although it is often produced by direct violence. The articular, pulley-like surface of the astragalus is forced below the outer malleolus, and there is always fracture of the inferior portion of the fibula; without this, indeed, the occurrence would seem to be impracticable. This form of luxation has been described by most authors as displacement inwards.

In this variety of the accident, both malleoli are sometimes broken off, in consequence of which the superior surface of the astragalus slips away from the articulating surface of the tibia, and places itself in the gutter between this bone and the fibula. The foot, in this case, is nearly flat, as the patient stands up, with a slight upward inclination of its inner margin, and the lower extremity of the tibia forms a remarkable prominence, rendered the more conspicuous on account of the displacement of the internal malleolus, which, when broken, is always drawn over towards the fibula. Great deformity also exists at the outer border of the ankle, caused by the projection of the inferior fragment of the fibula.

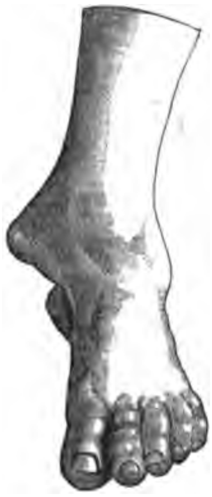
The *signs* of this luxation are unmistakable. The internal malleolus forms a remarkable projection under the integuments; the foot has a twisted appearance, and is easily rotated upon its axis, its inner border resting on the ground; a considerable depression exists on the outer surface of the leg, a short distance above the joint, corresponding with the line of fracture of the fibula, and the astragalus can be distinctly perceived below the external malleolus.

The *reduction* is effected by flexing the leg strongly, so as to relax the gastrocnemial muscles, and then drawing the articulating surfaces towards each other in a direction contrary to that of their displacement. The whole procedure is one of great simplicity. Maintenance is preserved by means of adhesive strips, so arranged as to keep the ends of the broken fibula in a straight line, and the articulating surfaces of the displaced bones in close apposition, due support being afterwards given to the foot by a tin-case or side splints.

5. In the dislocation *upwards*, of which only a few cases have been recorded, the astragalus is forced upwards between the two bones of the leg, the fibula being fractured some distance above the joint, and widely separated from the

tibia. The astragalus preserves its natural direction, but is so firmly impacted as to render its restoration a matter of difficulty. The two malleolar projections are extremely prominent, and descend nearly as low down as the sole of the foot, which is usually inclined a little to one side. Occasionally, as in a case referred to by Mr. Druitt, fig. 48, the astragalus is thrown up between the tibia and fibula without any fracture of these bones.

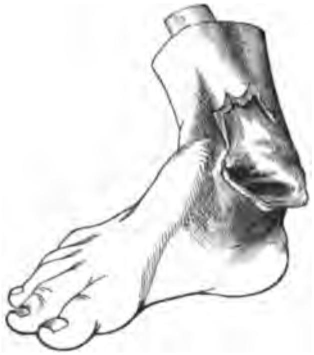
Fig. 48.



Dislocation of the astragalus upwards between the tibia and fibula.

The *after-treatment* in the luxations now described requires the most assiduous care and attention in order to prevent anchylosis. Anodyne and astringent lotions, and, in the more severe forms, free leeching, will be necessary to keep the inflammation within due limits. Proper support, in an easy posture, must be given to the leg and foot until all danger of displacement is over. Passive motion and sorbefacient remedies will complete the cure. In most cases, however, the joint will long remain weak, and, in not a few, loss of motion, partial or complete, will be inevitable.

Fig. 49.



Compound dislocation of the ankle-joint.

The ankle is not infrequently the subject of *compound dislocations*, the wound in the soft parts penetrating the cavity of the joint, and affecting, perhaps, the principal vessels and nerves of the limb, at the same time that there may be violent contusion of the integuments, and extensive comminution of the bones of the leg. In such a case, which is well displayed in fig. 49, from a preparation in my collection, the surgeon could not hesitate as to the course that ought to be pursued. Amputation alone can save life, and should be postponed no longer than is absolutely necessary for the occurrence of the requisite reaction. The lesion is profound, and an attempt to preserve the parts would be worse than foolish. When the injury is less violent, and the constitution sound, conservative surgery will often effect wonders, and is always worthy of a fair trial. When the ends of the bone protrude, excision will, as a general rule, be the only safe course. Whatever conservative measure be adopted, more or less anchylosis will always be inevitable, though the patient may ultimately regain a tolerably good use of his limb.

DISLOCATIONS OF THE TIBIO-FIBULAR JOINTS.

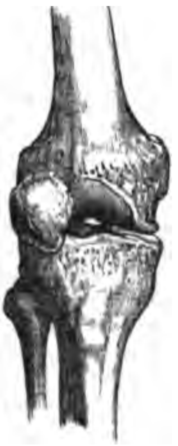
Dislocation of the tibio-fibular joints is an extremely uncommon occurrence; for, independently of their peculiar mode of articulation, and the great firmness and strength of the connecting media, the resistance offered by the interosseous ligament, and the protection which the fibula receives from its relations with the tibia, are so many causes which interfere with the disruption of their surfaces. It is only, indeed, the most violent injury that can give rise to the accident. There is a form of dislocation of the upper joint which occasionally occurs as a result of excessive relaxation of the fibulo-tibial ligaments, chiefly in weakly, delicate females, allowing the head of the fibula too much latitude of motion; but this is an occurrence very different from a real luxation, which is always occasioned by external force acting directly upon the component elements of the joint. Of the traumatic variety of the lesion, only a few examples are on record. Boyer has published the particulars of a case in which both joints were displaced simultaneously, the foot being at the same time dislocated outwards. Such an accident necessarily implies extensive laceration of the interosseous ligament, and can only happen by a fall upon the foot, or a blow upon the inferior extremity of the fibula, driving the bone upwards and outwards with the whole force of its leverage. Whatever may be the nature of the displacement, reduction is always easily accomplished by flexing the leg at a right angle with the thigh, and pushing the bone back in a direction contrary to that of its luxation. Maintenance, which is usually very difficult, must be effected by long-continued rest of the limb, and the use of a broad, elastic strap with a closely-fitting pad, acting directly upon the head of the bone.

In the *subluxation*, as it may be termed, of the upper tibio-fibular joint, the most suitable remedies are chalybeate tonics, with gentle exercise in the open air, the cold douche, electricity, the tincture of iodine, a series of little blisters, and the use of a proper supporter. If the case is rebellious, a delicate tenotomy knife may be introduced subcutaneously, and carried about in the joint in different directions, in order to scratch the articular surfaces, so as to provoke an effusion of plastic matter.

DISLOCATIONS OF THE PATELLA.

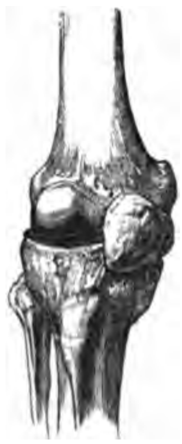
It is obvious, from the situation of the patella and the manner in which this bone is imbedded in the tendon of the extensor muscles of the thigh, that it is susceptible of being dislocated only outwards and inwards, or laterally. Displacement downwards is altogether impracticable, while that upwards cannot happen without rupture of the ligament by which this bone is connected to the tibia. Each luxation may be complete or incomplete. A remarkable form of the accident has occasionally been met with, chiefly of late years, in which the patella is dislocated edgewise, vertically, or upon its long axis. Whatever the character of the displacement may be, the occurrence is extremely uncommon. It is most frequently met with in thin, feeble persons, in whom it is usually produced by very trivial causes, as, for example, a sudden twist of the limb in dancing, walking, leaping, or stepping into bed. When there is a faulty conformation of the knee-joint, attended with a relaxed state of the ligaments, it may take place spontaneously, from the action of the extensor muscles conjoined with slight rotation of the leg, the thigh being fixed in the straight position. Sometimes the displacement is occasioned by direct violence, forcing the bone towards the opposite side of the articulation, or twisting it upon its long axis.

Fig. 50.



Dislocation of the patella outward.

Fig. 51.



Dislocation of the patella inward.

Of the two lateral dislocations, that *outwards*, fig. 50, is the more common; the patella lying at the external part of the joint, its outer edge being directed backwards, and the inner forwards. The signs are unmistakable. There is a remarkable depression in front of the knee, with a corresponding prominence on the outside; the inner condyle can be distinctly felt under the skin, and the leg is in a painfully extended position, without the possibility of being flexed.

Restoration is effected by placing the patient upon his back, and flexing the thigh upon the pelvis, the lower part of the leg resting upon the surgeon's shoulder, as he sits upon the edge of the bed. The object of this procedure is to relax the knee as completely as possible, when, pressure being applied to the bone, with the thumb and fingers, from without inwards, the patella will immediately be drawn into its natural position by the action of the extensor muscles.

In the dislocation *inwards*, fig. 51, the situation of the patella is reversed, its inner border being turned backwards and the outer forwards. The leg is extended and cannot be bent; the outer condyle looks as if it were depressed, and a characteristic prominence exists at the internal aspect of the knee. The reduction is effected in the same manner as in the former case.

Although these lateral dislocations of the patella are generally reduced with great facility by the method here advised, cases occasionally occur in which the operation is attended with immense difficulty, the most accomplished surgeon being sometimes foiled for a long time, notwithstanding the best directed efforts. It is said that Sabatier completely failed in an instance of this kind; and Dorsey, on one occasion, nearly experienced a similar fate. Being called to a young lady who had luxated her rotula in stepping into bed, he did not succeed in effecting restoration until after many fruitless attempts, although he saw the patient within five minutes after the accident. When the difficulty is unusually great, it may generally be surmounted by forcibly flexing the leg, and then rapidly extending it; a procedure which has the effect of disengaging the bone from its impacted position.

The dislocation in which the patella is displaced edgewise, *vertically*, or upon its long axis, is altogether a singular accident, the very possibility of which was denied by nearly all surgeons until a very recent period. It is, indeed, difficult to conceive how a bone, which is so firmly imbedded as this is in tendinous matter, can lend itself to such a freak, which has the effect of turning it completely on its side, so that its outer edge lies immediately under the integuments in front of the knee, while the inner rests in the sub-condyloid fossa of the femur, being firmly and almost immovably wedged in its new position, the anterior face looking inwards, and the posterior outwards. Sometimes the position of the patella is almost entirely reversed, the surfaces changing situations, the anterior looking backwards, and the posterior in the opposite direction. The occurrence, however, is very uncommon.

The lesion is generally produced by violent muscular action conjoined with a sudden and forcible twist of the knee; occasionally, however, it is caused by a fall or blow upon the bone, the leg being semiflexed, and strongly rotated upon its axis. A case has been reported in which it happened in wrestling; and at least two instances are known where it resulted from the forcible collision of the knees in a sham fight upon horseback.

The *signs* of this dislocation are characteristic. The leg is perfectly straight, but may occasionally be slightly flexed, though not without excessive pain; the patella forms, by its outer edge, a hard, prominent ridge in front of the knee; a deep depression exists upon each condyle; and the extensor muscles are in a state of extreme tension.

The *reduction* of this luxation has generally been found extremely difficult, owing, apparently, to the trouble which is experienced in disengaging the bone from the sub-condyloid fossa, where it is almost as firmly impacted as if it were screwed fast. On several occasions, indeed, the most violent efforts, conjoined with the division of the ligament of the patella, were hardly sufficient to accomplish the object. In a case mentioned by Dr. Gazzam, of Pittsburg, the only effect of the operation was to render the bone a little more movable, but the attempts afterwards to reduce it were just as unavailing as before. In another instance, the surgeon, Dr. Wolff, divided both the ligament below, and the extensor tendon above, the bone, and yet he found it impossible to restore the parts to their natural relations. Violent disease of the joint ensued, and the patient ultimately perished from profuse discharge and hectic irritation. Fortunately, such measures are not likely to be again repeated, since experience has shown that they are not only inefficacious, but dangerous.

The proper method of reduction consists in flexing the thigh strongly upon the pelvis, and in bending the leg forcibly, and to the fullest extent, upon the thigh, the limb being again immediately brought into a straight line, at the same time that an effort is made to push the bone strongly over towards the inner part of the joint. By repeating this manœuvre several times, in rapid succession, the patella suddenly leaves the sub-condyloid notch, and jumps back, with a distinct snap, into its natural situation. Extension, even when carried to excess, does no good in effecting reduction; on the contrary, in every case in which it has been tried it has signally failed, having apparently produced only still further impaction of the bone.

After the reduction of these different dislocations, the patient must be subjected for some time to rest and the usual antiphlogistic measures; and when he is able to move about, it will be necessary to support the joint for many months with a laced gum-elastic cap.

Displacement of the patella *upwards* can occur only when there is a rupture of the ligament of that bone, in consequence of the inordinate action of the extensor muscles, or violence applied to the anterior surface of the knee. The injury is easily recognized by the flattening of the joint, by the projection upon the inferior part of the thigh, and by the inability of the patient to extend the limb. The treatment is precisely the same as in fracture of the patella.

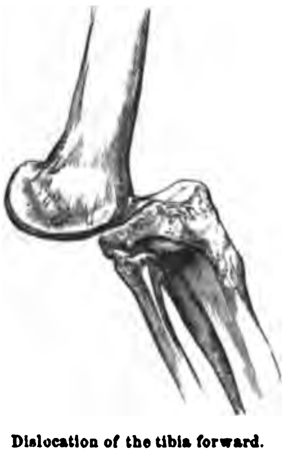
A few instances of *congenital* luxation of the patella are upon record; some of them of an equivocal character, others well authenticated. The occurrence is very uncommon.

DISLOCATIONS OF THE KNEE.

Dislocation of the tibio-femoral articulation, or of the tibia from the condyles of the femur, is of very infrequent occurrence, owing, mainly, to the numerous and powerful ligaments by which their articulating surfaces are united together. In this respect, there is no other joint in the whole body so well provided. If it were not for this arrangement, luxation could hardly fail to be very common, as the knee not only admits of extensive motion, but has unusually shallow surfaces, with no very strong support from the neighboring muscles, such, for instance, as exist in the hip, shoulder, and elbow.

The tibia may be thrown from the condyles of the femur in four different directions, namely, forwards, backwards, inwards, and outwards, or to either side. The latter two are the most common, and are always incomplete, owing to the great extent of the articular surfaces, and the difficulty of rupturing all the ligaments in the lateral direction of the joint. In regard to the dislocations forwards and backwards, it was generally supposed, until lately, that they were always complete, but the accurate researches of Malgaigne have proved that they are most frequently partial. Besides these displacements, the knee is subject to a species of subluxation, dependent upon a change of location of the semilunar cartilages. This, indeed, is more common than all the other forms of the lesion together, and is, therefore, of sufficient importance to demand separate notice.

Fig. 52.



Dislocation of the tibia forward.

1. Dislocation *forwards*, fig. 52, is occasioned by falls upon the foot while the knee is in a bent position, or by force acting upon the anterior and inferior part of the thigh, driving the femur backwards behind the head of the tibia; in either case, the occurrence will be promoted if, at the moment of the injury, the leg is slightly rotated on its axis, so as to increase the strain upon the joint.

The head of the tibia is pushed upwards and forwards, lying in front of the condyles, and generally presenting a somewhat twisted arrangement; the patella is drawn up beyond its natural level, into a sort of hollow, just above the tibia, and may easily be lifted up with the thumb and fingers; the tendon of the extensor muscles is much relaxed; and there is shortening of the leg from an inch and a half to two inches. The condyles of the femur are situated in the ham, where they form a large tumor, which gives the part an unusually prominent appearance, and which occasionally exerts such a degree of compression upon the vessels as to interrupt the circulation in the dorsal artery of the foot.

The complete form of dislocation of the tibia, whether forwards or backwards, must necessarily be attended by most extensive rupture of the ligaments of the joint, and is, therefore, always to be regarded as a very serious accident. When the condyles are impelled backwards with unusual violence, there will be great danger of laceration of the popliteal vessels, especially of the artery of that name, either in the shape of direct rupture, or of a partial destruction of its inner and middle tunics; occasioning, in the former case, copious subcutaneous hemorrhage, the pressure of which may finally cause gangrene of the limb; and, in the latter, the gradual dilatation of the artery into an aneurismal tumor, the ultimate effects of which may not be less disastrous. In all cases there is rupture of the popliteal muscle. When the injury to the joint and the parts around is very grave, the danger to limb and life may be such as to require amputation; but, ordinarily, the patient rapidly recovers from the immediate effects of the lesion, and eventually obtains a useful limb, although it may remain weak for a long time.

The *reduction* is readily effected by counter-extending the thigh and pulling the leg somewhat backwards, the surgeon's arm resting in the ham, and pressure being made upon the head of the tibia.

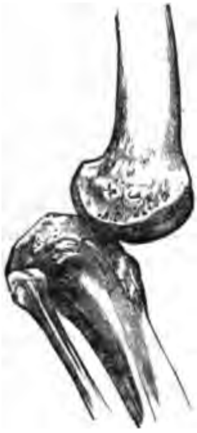
The following case, the only one that I have ever seen of dislocation of the head of the tibia forwards, affords a good idea at once of the symptoms of the accident, and of the proper method of reduction.

A very large, stout, heavy woman, forty-eight years of age, while engaged in feeding her poultry, received a severe fall from the sudden slip of the right foot, which, bending outwards, caused the whole weight of the body to be thrown upon the corresponding knee. I saw her four hours after the occurrence of the accident, when several fruitless attempts had already been made at reduction. The knee, which was very painful and a good deal swollen, appeared to be unusually wide from side to side; a circumstance partly due to the tumefaction of the soft parts. The leg was one inch and a half shorter than the opposite one, and in a straight line with the thigh. The patella had sunk behind the head of the tibia, into a kind of hollow, which imparted to the front of the joint a flattened aspect. Upon grasping the bone, however, with the thumb and fingers, it was easily drawn forwards, leaving a remarkable vacuity behind, in consequence of its distance from the inferior extremity of the femur. The condyles of the thigh-bone lay in the popliteal space, posterior to the head of the tibia, where they formed a large prominence, more distinct on the inside than on the outside, and situated, as it were, in the upper and back part of the leg, the muscles of which were unusually tense. The head of the tibia lay in front of the condyles, where its outlines could easily be traced with the eye and finger. Above this bone, as already stated, was the patella with its ligament and the tendon of the extensor muscles, forming a broad, thick cord in front of the thigh-bone, from which it was removed more than two inches. The leg was easily drawn away from its fellow, but could not be carried inwards, showing that there was extensive rupture of the internal lateral ligament. There was no contusion of the soft parts, nor any discoloration of the integuments.

Chloroform having been administered, a stout lac was applied to the upper part of the thigh, and confided to an assistant, to make the requisite counter-extension, while extension was made by another assistant grasping the foot, the limb being in the extended position. Placing now my left forearm behind the knee, and requesting the aids to pull gently and steadily, I suddenly, with my right hand, bent the leg backwards, and thus in a few seconds effected the reduction, the bone returning with a distinct snap. The limb being laid in an easy position, cold cloths were applied to the knee, and a grain of morphia administered to allay pain and prevent spasm.

No untoward symptoms appeared after the reduction. The patient kept her bed for nearly a fortnight, and made free use, after the first twenty-four hours, of medicated lotions, to moderate and subdue inflammation. Purgatives and light diet were also enjoined. In due time passive motion was instituted; the limb was frequently bandaged; and in less than a month from the time of the accident, the woman was able to walk about the house with the aid of crutches. The joint, however, remained weak for a long while, and even now, several years after the occurrence of the injury, the slightest fatigue is attended with temporary lameness.

Fig. 53.



Dislocation of the tibia backward.

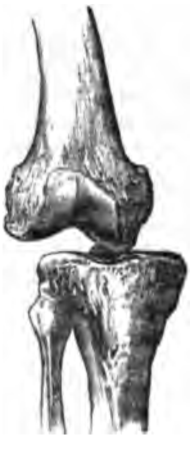
2. Luxation of the tibia *backwards*, fig. 53, is so rare an accident that the possibility of its occurrence was called in question by many of the older surgeons. Modern experience, however, has not only shown the error of this opinion, but has pointed out with great accuracy the mechanism, signs, and method of reduction of the displacement. The causes are similar to those of luxation forwards.

The head of the tibia lies in the popliteal region, where it compresses the vessels and nerves of that name, at the same time that it pushes back the popliteal and other muscles, and forms a distinct prominence, easily perceptible by sight and touch. In front of the joint is the large projection representing the condyles of the femur, and immediately below these again is the patella, with a strongly marked depression on each side, its ligament being drawn tightly under the articular surface of the thigh-bone, and the tendon of the extensor muscles firmly stretched. The leg has the appearance of being slightly rotated, and is always considerably shortened, though less so than in the luxation forwards. In regard to its position no definite rule can be laid down, as it varies much in different cases, being at one time flexed, at another extended.

The *reduction* is effected upon the same principles as in dislocation forwards, the thigh and leg being pulled in opposite directions, and pressure made upon the head of the tibia, while the patella is fixed by the hand in front.

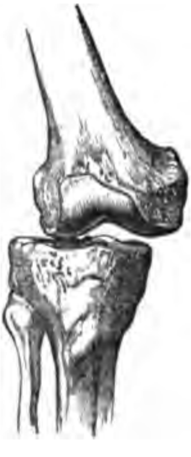
3. The *lateral* dislocations of the tibia are always incomplete. They occur with nearly equal frequency, generally in consequence of falls, or of the passage of the wheel of a carriage, in which the femur is violently twisted while the leg itself is firmly fixed. Another cause is force applied to the lower and lateral part of the leg at a moment when the knee rests upon a hard, resisting object and the trunk is inclined sideways, thus throwing the whole strain upon the edge of the joint. Much injury of the soft parts almost always attends these displacements, and the leg generally presents a remarkably twisted appearance.

Fig. 54.



Dislocation of the tibia inward.

Fig. 55.



Dislocation of the tibia outward.

In the luxation *inwards*, fig. 54, the head of the tibia is thrown off the corresponding condyle of the femur, and forms a large tumor at the inner side of the knee. In the displacement *outwards*, fig. 55, the signs are reversed, the tibia projecting at the external aspect of the joint, and the condyle at the inner. The leg, in both cases, is slightly flexed and rotated on its axis, the extensor muscles are relaxed, and a marked depression exists in the natural situation of the patella, which is pushed to one side or the other, according to the character of the displacement. The diagnostic signs are the twisted state of the limb, and the great increase of the width of the joint.

Owing to the extensive laceration of the ligaments of the joint, the lateral dislocations are reduced with great facility. All, in fact, that is necessary, is, while the thigh is fixed by an assistant, to pull the leg by grasping it just above the ankle, and to push the head of the tibia in a direction contrary to that of its displacement.

The *after-treatment* of all these luxations must be conducted upon strictly antiphlogistic principles. The patient should be confined to his bed for at least a month, and blood should be taken freely by leeches, and even by the lancet, if he is robust, or if the inflammation runs at all high. . The great danger is anchylosis, which it will require the utmost care and diligence to prevent. The joint must be supported in an easy position, and passive motion must not be instituted too soon, lest it interfere with the reunion of the ruptured ligaments. When the patient is able to walk about, the knee must be protected with a laced-cap, and its tone improved by the cold douche, stimulating embrocations, and dry friction.

Complicated dislocations of the knee are not of infrequent occurrence, and are always to be dreaded on account of the constitutional sympathies which they are apt to awake. When the joint is laid freely open, and the soft parts are otherwise seriously injured, there can hardly be any doubt as to the propriety of immediate amputation, for such cases nearly always terminate unfavorably, the patient dying either of tetanus, pyemia, traumatic fever, or excessive suppuration; or, if he chance to recover, he will owe his life rather to good luck than to the skilful management of his attendant. It is generally difficult to make the patient comprehend the importance of what will always appear to him so harsh a measure, especially if he is a young man of temperate habits, and in excellent health at the time of the injury; he will resist the operation in spite of the arguments and entreaties of his surgeon, and will only consent when it is too late for him to be benefited. I am satisfied that there is no class of lesions more dangerous both to life and limb than compound dislocations of the knee, especially when at all severe; and I, therefore, do not hesitate to recommend the prompt adoption of decisive measures. When the soft parts are not too much affected, excision may advantageously be substituted for amputation, though, in general, the latter is unquestionably the safer procedure.

Examples of *congenital* luxation of this joint have been reported by different authors, as Cruveilhier, Robert, Guérin, Kleeberg, and Bard. The displacement, which is generally incomplete, and associated with other malformations, may occur in any direction, but that forward is by far the most common.

In 1863, Dr. Kasner sent to my clinic at the College a female child, aged two years, on account of a congenital dislocation of each knee, accompanied by absence of the patella. The tibia lay in front of the femur, the situation of its head being indicated by a distinct prominence, and by a peculiar crescentic fold in the skin. The condyles of the thigh-bone, on the contrary, formed a very large tumor on the back part of the leg, and seemed to have been considerably rounded off. The leg was shortened about two inches and a half. The child, which was puny and unhealthy, could readily extend the limb, as well as move it laterally, but was unable to flex it at the joint, nor could this be done beyond a few inches by my own efforts. The dislocations could be reduced by extension and counter-extension, but immediately recurred upon their cessation.

DISLOCATIONS OF THE SEMILUNAR CARTILAGES.

The semilunar cartilages are subject to a species of displacement known under the name of subluxation, an affection which was first described by Mr. Hey, of Leeds, and which is most commonly met with in feeble, delicate persons, who have suffered from chronic disease of the knee. A sudden and forcible twist of the joint occasioned by striking the toes against a stone, or an accidental slip in walking while the foot is turned inwards and the thigh outwards, is the usual cause of the mishap. The lesion essentially consists in the partial removal of the semilunar cartilages from their natural position, thus allowing them to become wedged in between the tibia and femur, simply as an effect of the relaxed condition of their ligamentous connections. Occasionally, however, the wrench is so violent as to detach some of these connections from the bone.

Well-marked *symptoms* always attend this form of luxation. The patient is suddenly rendered conscious of some accident, which causes him to feel faint and sick, and immediately compels him to sit down. The pain is very excruciating, and he is unable to stand, or to extend the limb, which is generally semiflexed. If the joint is examined within a few minutes after the occurrence of the injury, its size and shape will be found to be perfectly natural, and an inexperienced surgeon might conclude that the case was merely a slight sprain. In a short time, however, considerable swelling sets in, and the articulation before long imparts a distinct sense of fluctuation from the deposit of synovial fluid, caused by inflammation of its lining membrane. The excessive pain and shock are due to the pressure which the tibia and femur exert upon the displaced cartilages, in consequence of the changes in their mutual relations, and, also, to the forcible distension of some of the ligamentous structures of the joint. The dislocation, having once taken place, is extremely liable to recur from the most trivial causes; and under such circumstances I have repeatedly noticed that, although the patient was always obliged to keep his leg in a slightly bent position, yet he was able, when he sat on a high seat, to move it nearly as well as the sound one.

The *reduction* should be performed under chloroform, otherwise it will be very painful. The most eligible position is the recumbent, the thigh being strongly flexed upon the pelvis. The surgeon, placing his arm in the popliteal hollow, and grasping the limb just above the ankle, bends the knee suddenly and forcibly, and then rapidly extends it, at the same time imparting a movement of rotation to the leg. By this triple manœuvre the pressure of the condyles is taken off from the semilunar cartilages, and the parts are enabled to return to their natural situation. Sometimes the ingenuity of the patient will enable him to effect reduction when that of the surgeon fails. Sir Astley Cooper mentions the case of a gentleman who was in the habit of relieving himself by bending the thigh inwards and pulling the foot outwards, as he was sitting on the floor. In some instances, again, the parts are found to return of their own accord after the usual means have failed, either while the patient is seated, or lying asleep in bed.

It is always proper after such an occurrence to keep the joint for a few days perfectly at rest until it has, in some degree, recovered its original tone. When the patient begins to exercise he should wear a laced knee-cap, and guard against any sudden twist of the limb, a recurrence of the dislocation being, as already stated, extremely prone to happen after all injuries of this kind. Sorbefacient liniments and the cold douche will be of service in promoting the removal of effused fluids, and imparting vigor to the relaxed structures.

DISLOCATIONS OF THE HIP-JOINT.

Dislocations of the ileo-femoral joint are far less frequent than those of the shoulder, a circumstance which evidently depends more upon the peculiarity of structure of these articulations than upon any difference in their motions, which are sufficiently free and varied in both, though certainly less so in the former than in the latter. The hip-joint affords the best type of the ball and socket joint with which we are acquainted. The acetabulum is of immense depth, and, therefore, furnishes ready accommodation to the large and well-formed hemisphere which constitutes the head of the femur. The glenoid cavity of the scapula, on the other hand, is very shallow, and yields very inadequate support to the head of the humerus, in the varied and extensive movements of the shoulder. Besides, there is a great difference in the ligaments which bind the bones to each other in these articulations. The capsular ligament of the shoulder is comparatively weak, while that of the hip is by far the most powerful in the body, at the same time that it is most closely and firmly fitted round the parts which it is designed to retain and to protect. In addition to this, the latter has a ligament peculiar to itself, the inter-articular, which serves to connect the head of the bone directly to the margin of the acetabulum, an arrangement which is altogether wanting in the shoulder, the long head of the biceps forming a very imperfect substitute. Finally, the hip-joint is under the cover and protection of large and powerful muscles, which are much more capable of resisting the effects of dislocating agents than those of the shoulder, which, in fact, often rather promote the occurrence of the accident, if they do not actually produce it by their own ill-directed efforts.

Dislocations of the hip-joint are much less frequent in women than in men, owing, no doubt, simply to the differences in their occupations. If women were as constantly exposed to all kinds of external violence, especially to falls and blows, as the other sex, they would probably suffer quite as often, not only from these accidents, but also from luxations of the other articulations, which, however, as is well known, is far from being the case. Displacements of the shoulder occur at least from six to eight times as frequently in the male as in the female, and in the ileo-femoral joint the disproportion is still more remarkable.

Displacement of this joint is, next to that of the shoulder, more frequent than in any other joint of the body. Of the cases collected by Malgaigne, 491 in all, 321 occurred in the shoulder and 34 in the hip, the clavicle coming next in order.

Age exerts an extraordinary influence upon the production of these accidents. It is very uncommon to meet with a luxation of the hip-joint in children, because a degree of force capable of inducing it in the adult would be more likely to lead to separation of the epiphyses of the bone, owing to its imperfect development, and consequent inability to resist external injury. In the old the lesion is also unusual, for at that period of life the osseous tissue is so brittle as to be liable to be broken by the slightest causes. Hence, fracture of the neck and upper extremity of the femur is much more frequent in both sexes after the age of fifty-five than displacement of the head of that bone from the acetabulum. Dislocation often occurs from the twentieth to the twenty-fifth year, but is most common from the thirtieth to the forty-fifth. The youngest case of displacement of the hip-joint on record happened at eighteen months; the oldest at eighty-six years. Dr. William Gibson mentions an instance of simultaneous double coxo-femoral dislocation. A few examples have been recorded of individuals who possessed the power of voluntarily luxating the hip-joint.

The head of the femur is susceptible of being dislocated in four principal *directions;* upwards, upon the dorsal surface of the ilium; backwards, into the sciatic notch; downwards, into the thyroid foramen; and forwards, upon the pubic bone. Of these displacements the first is by far the most common; next in order of frequency is that into the sciatic notch, and the rarest of all is the last. Sir Astley Cooper, whose experience in dislocations of the hip-joint was very great, estimated that out of every twenty cases twelve would be on the dorsal surface of the ilium, five in the sciatic notch, two in the thyroid foramen, and one on the pubic bone. I am sure that the observation of most surgeons must accord, in a general manner, with this opinion. To the extreme rarity of the last two forms of luxation every one can bear testimony. The reason of the great frequency of iliac dislocations is to be found, I presume, rather in the position in which the thigh is usually placed at the moment of the accident than in any differences in the structures of the hip-joint at particular portions of its extent, certain attitudes of the limb always favoring the occurrence of certain displacements.

Besides the varieties of luxations now enumerated, there are several others which, although extremely infrequent, are too important to be omitted in a systematic treatise on surgery. These will, therefore, be briefly described under another head, as rare, unusual, or anomalous dislocations of the ileo-femoral articulation.

It will greatly simplify the study of the four principal varieties of this accident if they be described as the iliac, sciatic, thyroid, and pubic, terms which every one understands, and which cannot fail to convey a clear general idea of the locality of each displacement to which they refer.

All these luxations are complete, the head of the femur being forced entirely out of its socket. Great violence is necessary for their production, and they always take place so much the more easily in proportion as the force is diffused over a large surface. I am not acquainted with a solitary instance in which they were the direct and immediate result of muscular contraction, as occasionally happens in dislocations of the shoulder-joint. Such an event could only occur when there is previous disease of the articulation, destroying its ligamentous connections. The violence may act either directly upon the hip, or indirectly through the knee or foot, and the nature of the displacement will depend upon the direction in which it is applied. Thus, luxation into the thyroid foramen can only be produced when the limb is powerfully abducted at the moment of the accident, and the occurrence will be promoted if the strain is increased by the person having a heavy weight upon his shoulder.

In every dislocation of the hip there must necessarily be extensive injury to the soft parts. The capsular and inter-articular ligaments are of course torn, and the same fate is nearly always shared by the rotator muscles of the femur. The two large gluteal muscles, however, and the psoas and iliac, which are attached to the small trochanter, usually escape, or are, at most, only put upon the stretch. When the external violence has been uncommonly severe, a considerable effusion of blood may be expected in and around the joint, and there will be likely also to be more or less contusion of the integuments and muscles, especially if the injury has been direct.

1. In the *iliac dislocation*, the head of the femur is thrown upwards and backwards upon the dorsal surface of the ilium, fig. 56, resting in the fossa of that bone, either under or upon the small gluteal muscle. In some cases, though rarely, it is thrust a good deal forwards instead of backwards.

The accident occasionally occurs very early in life. The youngest case on record is one related on the authority of Lisfranc of a child of eighteen months.

Fig. 56.

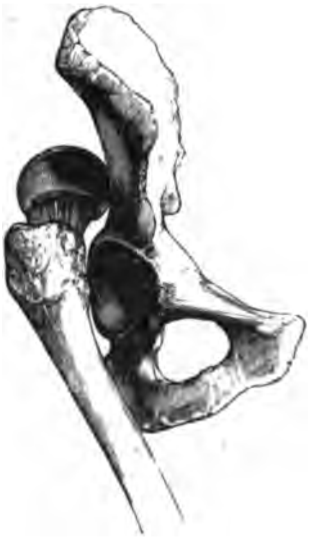
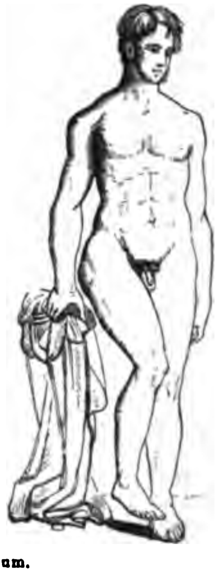


Fig. 57.



Dislocation on the dorsum of the ilium.

Kirby and Buchanan each observed it at three years; Image at three and a half; Litten at four; Travers at five; Sir Astley Cooper at seven. The youngest case I have seen occurred in a lad of fourteen years, sent to the Clinic of the Jefferson Medical College, in 1863, by Dr. Saulsbury, of Delaware.

The *signs* of the accident, fig. 57, are sufficiently obvious, exhibiting rarely any material variation. The hip is considerably deformed, being more salient than natural, the upper part of the thigh is unusually full, and the gluteo-femoral crease is on a higher plane than common. The great trochanter is carried upwards and inwards, in closer proximity with the anterior superior spinous process of the ilium, and is more conspicuous than in any other accident, except coxalgia. The head of the bone may readily be felt in its new situation, particularly in thin, lean subjects, and on rotating the thigh it is found to roll about under the finger. The limb is from one and a half to two inches and a half shorter than in the normal state; the foot is strongly inclined inwards, the big toe pointing towards the opposite tarsus; the knee, as the patient stands, is a little above and somewhat in advance of the sound one, any attempt to turn it out proving impracticable, and causing severe pain; the thigh is slightly bent upon the pelvis, and may with a little effort be carried across the sound one; the leg is flexed upon the thigh; the heel is raised off the floor; and the limb, firmly fixed in its constrained position, cannot be restored to its proper length without reducing the dislocation, nor can it be moved except a little inwards. When the patient lies down, the foot rests on the bed, but the knee is considerably raised, and all attempts to extend it are unavailing.

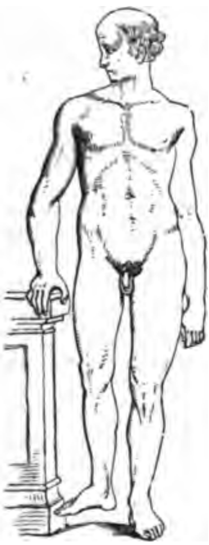
The luxation is generally occasioned by falls upon the knee or foot while the thigh is strongly adducted and thrown forwards beyond the line of the body. In this way the head of the femur, being powerfully rotated inwards, is thrust forcibly upwards and backwards, tearing the capsular ligament in that direction, escaping from the acetabulum, and lodging in the lower part of the iliac fossa, under or upon the small gluteal muscle. The accident may also be produced by violence applied directly either to the hip or to the upper extremity of the femur, as by the fall of a heavy body, when the limbs are widely separated, and the trunk is inclined strongly forwards. The two obturator, geminal, square and pyriform muscles are greatly stretched, and sometimes even partially ruptured, while the psoas and iliac are relaxed, as are also the adductor, pectineal, and gluteal. The round ligament is of course torn. The powerful tension into which the external obturator muscle, a fleshy mass of large size and great strength, is thrown by the accident, is the immediate cause of the immobility of the limb, of the inversion of the foot and knee, and of the excessive pain which follows any attempt at rotation and abduction.

The *diagnostic signs* of the dislocation are, the great prominence of the trochanter and its proximity to the anterior superior spinous process of the ilium; the inverted and shortened state of the limb; the fixed position of the head of the bone in its new situation; and the impossibility of abducting and rotating the knee.

The only accident with which this luxation is at all likely to be confounded is fracture of the neck of the femur, fig. 58, within the capsular ligament. In general, however, the diagnosis is established with great facility. All, in fact, that the surgeon has to do is to remember that, in fracture, the trochanter is drawn backwards, and less salient than usual; that the foot is everted instead of being inverted, as in luxation; that the limb can readily be restored to its proper length by extension, but that it will immediately resume its former position when the extension is discontinued; and, finally, that, when the ends of the fragments are brought in contact with each other, crepitation may promptly be elicited by rotating the thigh. Moreover, the limb may be moved, although not without great suffering, in every direction, and not merely inwards and slightly upwards, as in dislocation.

Difficulty in regard to the diagnosis occasionally arises from injury of the superior extremity of the femur, attended with fracture of the great trochanter, in consequence of the detached fragment being drawn upwards and backwards by the action of the muscles, into the fossa usually occupied by the head of the bone in luxation. The signs of distinction are, the mobility of the broken piece, the absence of inversion of the limb, and our ability to carry the thigh about in different directions, although not without severe pain.

Fig. 58.



Intra-capsular fracture of the thigh-bone.

The symptoms of iliac dislocation are sometimes painfully simulated by a fracture of the acetabulum, allowing the head of the femur to escape into the pelvis. Or, a portion of the margin of this cavity may be broken off, and the bone ascend into the iliac fossa. The signs of distinction are, the existence of crepitation and the greater amount of injury sustained by the soft parts. When the cotyloid border is detached, the fact will be denoted by the incessant tendency to recurrence of the dislocation after reduction.

The degree of shortening attending the iliac variety of displacement is best ascertained by extending a piece of tape, or a graduated measure, from the anterior superior spinous process of the ilium to the centre of the tuberosity of the internal condyle of the femur on each side. Or, instead of this, the tape may be carried along the middle line of the body, from the centre of the fourchette of the sternum to the sole of the foot, placed at a right angle with the leg. The difference in the result will indicate the extent of the defect. There is considerable variation in regard to the amount of shortening in different cases. On an average, it may be stated to range from two inches to two inches and a half; but occasionally it is as much as three inches and a half, and, on the other hand, as little as an inch and a half.

It is surprising that writers should invariably insist upon stating that there is less prominence of the great trochanter in this variety of luxation than natural, whereas a little reflection will serve to convince any one that such an opinion is altogether untenable. To prove the truth of this remark it is only necessary to examine the position which the femur assumes in consequence of the dislocation. The whole limb being strongly rotated inwards, the trochanter, as it lies in its new situation just above the rim of the acetabulum, or partly above and partly below, is necessarily tilted up and brought forwards, so as to augment, in a very striking degree, its saliency beneath the integuments and muscles of the gluteal region. An excellent idea of the changes produced in the projection of the trochanter may be formed by alternately everting and inverting the foot strongly in the ordinary standing attitude, so as to make, on the one hand, the big toe of the rotated limb point against the opposite tarsus, and, on the other, the heel against the hollow between the tendo Achillis and the inner malleolus. In the former position, the bony eminence will be remarkably prominent, jutting out as a rounded mass, whereas in the latter it will hardly be perceptible, or, at all events, be comparatively small. In displacement of the head of the bone upwards and backwards, the projection is abnormally distinct, and is, therefore, a sign of great diagnostic value.

The *reduction* of this dislocation may generally be readily effected by simple manipulation, a fact first clearly established by Dr. W. W. Reid, of Rochester. In a paper, published in 1851, he conclusively showed, by a series of admirably conducted experiments, dissections, and clinical observations, that the chief impediment to restoration is not, as was formerly supposed, the contraction of the muscles that are affected by the accident, but the indirect action of the muscles that are put upon the stretch by the malposition of the dislocated bone, and that the operation may always be safely, certainly, and expeditiously performed, without any assistants, pulleys, or, in short, any extraneous aid whatever.

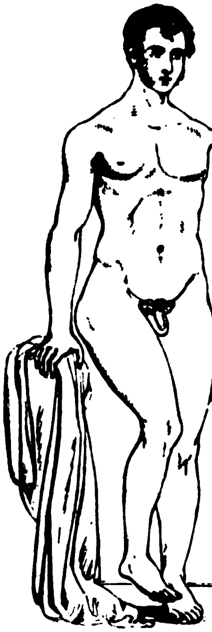
The reduction consists of certain processes and evolutions, in which the shaft of the femur is employed as a lever, and the pelvis as a fulcrum, the object being, in the first instance, to dislodge the head of the bone from its new situation, and then to induce the muscles to pull it downwards and inwards into the acetabulum, thus compelling it, as it were, to retrace its steps along the route which it travelled in the dislocation. In conducting the operation, the most eligible plan is to make the patient lie upon the floor, as this affords a much firmer resistance than a lounge, bed, or low table, and gives the surgeon, moreover, a better opportunity of placing himself in any position that may be deemed requisite. The patient should be thoroughly anæsthetized, and if he is unusually stout and plethoric, it will not be amiss to bleed him copiously at the arm, as a preliminary measure, though in general this will not be necessary. In the female, exposure of the person is avoided by means of a sheet.

The operation may be described, for the sake of greater simplicity, as consisting of three stages. In the first, the surgeon, grasping the knee with one hand, and the leg just above the ankle with the other, flexes the thigh upon the pelvis and the leg on the thigh, carrying the limb across the sound one, and the knee over the abdomen as high up as the umbilicus. In the second stage, the knee is turned outwards on a line with the injured side, a procedure which will draw the big toe from its inverted into an everted position, and, of course, incline the heel proportionately inwards, or in the opposite direction. In the third stage, the foot is carried across the sound limb, and the knee pushed outwards and downwards, when, the thigh being gently rotated, the head of the bone slips at once into its socket, with an audible jerk, and the injured limb resumes its natural position. The whole operation may usually be performed in less than two minutes. On one occasion, I am sure, it did not occupy me half that time. It is impossible to conceive of anything more simple, efficient, and philosophical than the whole proceeding. As Dr. Reid justly observes, it not only relaxes the muscles concerned in the displacement, but it absolutely compels them, by their own efforts, to draw the bone into its proper position, making them thus, with a little effort on the part of the surgeon, the reducing agents.

2. The *sciatic dislocation* commonly results from falls or other violence applied to the foot or knee while the body is strongly inclined forwards upon the thigh, or the thigh upwards upon the pelvis. In either case the head of the bone, breaking through the posterior and lower part of the capsular ligament, slips backwards from its socket, and takes up its abode in the sciatic notch, resting upon the pyriform muscle, between the sacro-sciatic ligaments and the convex surface of the iliac bone. The capsular ligament is severed, and the psoas, iliac, and obturator muscles are put upon the stretch, and occasionally otherwise injured.

The *symptoms* of this dislocation bear so close a resemblance to those of the iliac that several late writers are disposed to regard them merely as modifications of the same lesion, the one being an exaggerated form of the other. I have myself, however, always looked upon them as separate and distinct varieties, and shall, therefore, so consider them on the present occasion. The adjoining sketch, fig. 59, conveys an excellent idea of the appearances presented by the injured limb, and a comparison between it and the preceding will serve to show that they differ from those of the iliac luxation only in being less marked. The limb is shortened from half an inch to an inch, and so firmly impacted in its new position that it is impossible to bend or rotate it; the great toe rests against the ball of the sound one; the knee is turned in and advanced over its fellow, but not so much as in the dislocation upwards; the trochanter, which is uncommonly prominent, is lower

Fig. 59.



Dislocation into the sciatic notch.

down than natural, and consequently further off from the anterior superior spinous process of the ilium; and the head of the bone is so deeply buried in the sciatic hollow as to render it very difficult to detect it by the finger, except in thin, emaciated persons. Both the thigh and leg are slightly flexed.

The characteristic *signs* of the dislocation are, the situation of the head of the bone behind and below the acetabulum, a short distance above the tuberosity of the ischium; the comparatively slight shortening of the limb; the firm impaction of the thigh in its new locality; and the unusual distance between the trochanter and the spine of the ilium.

In a case of sciatic dislocation recently under my charge, in a rather thin man, twenty-eight years of age, I took special pains to make a most accurate examination, and, from notes taken at the moment, I am enabled to append the following statement: The limb was nearly one inch shorter than the sound one, and strongly flexed at the knee. When an attempt was made to bring the thigh and leg in a straight line, the man complained of severe pain, and immediately raised his loins, so that it was quite easy to pass the fist and arm underneath. When the body was extended, the knee became immediately bent, as at the time of the accident. The limb lay close by the side of its fellow, and could neither be carried backwards nor outwards, but was easily flexed on the pelvis. When the man stood up, he threw his body very much forward, and the limb hung close by the side of the other, the knee being far in advance of the sound one and crossed somewhat over it; the foot was almost parallel with the other, but the heel was raised from the floor nearly two inches. Both in standing and lying, the trochanter was at least one inch further off from the anterior superior spinous process of the ilium than the opposite one, besides being unusually prominent; and the head of the femur could be distinctly felt on the dorsal surface of the ilium, at the upper part of the sciatic notch, rolling under the finger when the limb was rotated upon its axis.

The following case of unreduced sciatic dislocation of the left side, which I had an opportunity of dissecting some time ago, will serve to illustrate the morbid anatomy of this form of injury. The patient was a man, aged twenty-five, who had met with the accident more than eight years previously.

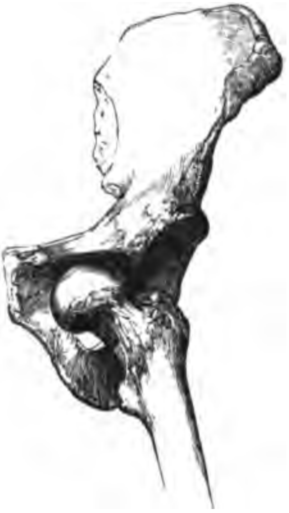
The knee and foot were much inverted, there was shortening of nearly one inch and a half, and the whole limb had a wasted aspect. The external gluteal muscle was nearly normal, but the middle and internal were excessively atrophied, shortened and fused together, their fibres being very pale, sparse, and partially transformed into fatty and fibrous tissue. The pyriform, also much reduced in size, was stretched over the head of the femur, and inseparably blended with the inner and middle gluteal. The geminal muscles and the tendon of the internal obturator were elongated, and twisted round the neck of the bone. The quadrate was lengthened, but not otherwise perceptibly changed.

The great trochanter was three inches and a half from the anterior superior spinous process of the ilium, and four inches and a half from the crest of that bone, its top being on a line perpendicular with it.

The head of the femur lay across the upper part of the sciatic notch, being two inches from the tuberosity of the ischium, and a few lines from the posterior inferior spinous process of the ilium, its distance from the crest of that bone being two inches and three-quarters. It was nearly completely divested of cartilage, and very rough, being studded with numerous little bony eminences. Surrounding it was a false capsule, varying in thickness from the fourth of a line to a line and a half, and composed principally of the remnants of the pyriform and the two small gluteal muscles; it was translucent at several places, rough on its inner surface, with here and there a serous, glistening point, and presented a large quantity of reddish filamentous tissue, just below the head of the bone, to which and to its neck it was firmly adherent. The ilium and sciatic ligaments which accommodated the bone were sound, and it was evident, from the manner in which the parts had been impacted, that but little motion existed after the accident. The acetabulum was nearly filled by a fibro-cartilaginous substance, its edges having been rounded off by absorption. No trace could be discovered of the capsular and round ligaments.

3. In the *thyroid dislocation*, fig. 60, the head of the femur is thrown downwards and forwards into the thyroid foramen, resting upon the external obturator muscle by which that opening is covered in, the great trochanter being turned backwards towards the acetabulum. It is caused by falls upon the foot or knee while the thigh is widely separated from its fellow, and inclined sharply backwards. It may also be occasioned by a heavy body, such, for example, as a sack of corn, striking the hip while the limb is in a state of abduction, and the trunk bent forwards. The gluteal muscles are drawn downwards, considerably flattened, and put upon the stretch; the pyriform is elongated and tense; the inter-articular ligament and the lower portion of the capsular ligament are torn; and the extensor muscles of the thigh form a hard, firm mass, reaching from the pubic bone to within a short distance of the knee.

Fig. 60.

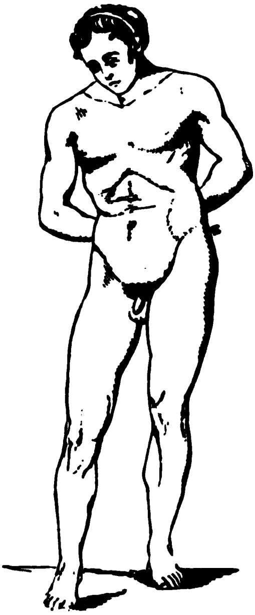


Dislocation into the thyroid foramen.

The *symptoms*, as seen in fig. 61, are remarkably prominent and distinctive. The hip has lost its convexity, and in place of the projection formed by the trochanter there is a decided flattening, and sometimes even a positive depression; the trochanter, moreover, is removed considerably further from the anterior superior spinous process than in the natural state. The limb is increased in length from an inch and a half to two inches, and, owing to the tension of the gluteal muscles, stands off in an awkward and constrained manner from the sound one, the knees being in consequence widely separated from each other. The trunk is bent forwards by the action of the psoas and iliac muscles, which are greatly stretched; and a large tumor is perceptible in the region of the thyroid notch, caused by the presence of the head of the femur, which, however, can only be felt distinctly in thin subjects, and in the absence of swelling. The knee is flexed, and much in advance of the sound one, and the foot, usually a little everted, is widely separated from its fellow. The movements of adduction, extension, and rotation are impracticable, but those of abduction and flexion may be executed by the surgeon, although not without excessive suffering.

When the patient stands erect and is viewed in profile, the body and limbs are found to form an obtuse angle with each other, owing to the contraction of the gluteal muscles, on the one hand, and to that of the iliac and psoas, on the other, the latter presenting at the same time a tense ridge at the side of the thigh, perceptible both to sight and touch; the toes rest on the floor, while the heel is usually somewhat elevated; the hip, by its flattened condition, contrasts strikingly with its fellow; the femoro-gluteal crease is lower down than natural; and the knee is observed to be greatly in advance of the opposite one. If the patient be requested to extend his body so as to bring it on a line with the thighs, he will find himself incapable of doing it, and will suffer severe pain from the attempt.

Fig. 61.



Dislocation into the thyroid foramen.

The *diagnostic* signs are, the widely separated state of the knees, the elongation of the limb, which does not exist in any of the other luxations of the hip, the forward inclination of the body, the flattened state of the nates, the excessive tension of the iliac and psoas muscles readily felt by the finger, and the impossibility of adducting, extending, and rotating the leg. Another good sign is afforded by the great trochanter, which will be found to be farther off from the anterior superior spinous process of the ilium in dislocation than its fellow is on the opposite side.

4. The *pubic dislocation* is extremely uncommon, and might, therefore, almost be classed among the rare forms of the accident. As the name implies, the head of the femur lies upon the horizontal branch of the pubic bone, or, rather, upon this bone and the iliac, fig. 62, above Poupart's ligament, and between the antero-inferior spinous process of the ilium and the femoral vessels, under cover of the iliac, psoas, and straight muscles. The displacement is caused by falls while the limb is pushed backwards and outwards, and there is a heavy load upon the shoulder, as when a man carries a bag of wheat, and his feet suddenly give way under him. Another mode in which it may be produced is by the sudden bending of the body backwards, while the foot is implanted in a ditch or hollow, and the femur is kept straight by the action of its extensor muscles. Under these circumstances the head of the bone ruptures the upper and inner portion of the capsular ligament, and slips out of its socket into the groin.

Fig. 62.

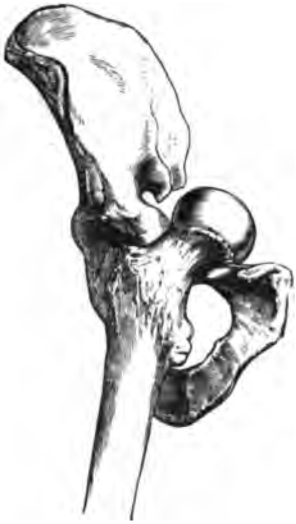
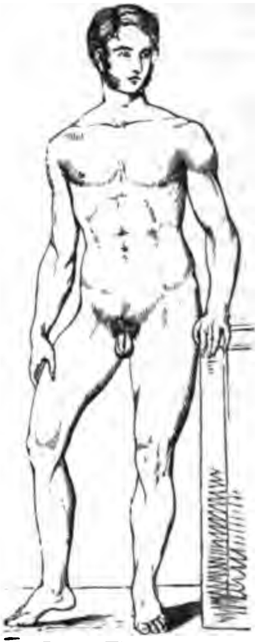


Fig. 63.



Dislocation on the pubes.

In this luxation, fig. 63, the limb is from half an inch to an inch shorter than the other; the foot and knee are everted, and separated from their fellows, though in a less degree than in the thyroid displacement; the buttock is flattened; the great trochanter lies nearer the middle line than naturally; the femoro-gluteal fold is above its ordinary level; and a distinct prominence, hard, rounded, and easily impressed by moving the leg, exists in the groin, just above Poupart's ligament, representing the head of the femur. Adduction and rotation inwards are impracticable. In a case of pubic dislocation seen by Physick, in 1805, the head of the bone lay beneath Poupart's ligament, and the limb was a little longer than the sound one. Larrey saw an instance in which the femur projected nearly at a right angle with the body.

The flattening of the buttock, the slight shortening of the limb, the eversion of the toes, the impossibility of rotating the thigh inwards, and the existence of the head of the bone in the groin, are marks which sufficiently characterize the accident to prevent mistake.

General Diagnosis.—If we compare these four varieties of luxations with each other, we shall find, with the exception of the first two, sufficiently broad marks of dissimilarity to render the diagnosis, with a little care, quite easy. The thyroid is the only one in which there is any lengthening of the limb; in all the others it is shortened, least in the pubic, and most in the iliac. In the iliac and sciatic the hip is abnormally prominent; in the other two it is flattened; in the former the knee and foot are inverted, in the latter they are everted, decidedly in the pubic variety, and generally very slightly in the thyroid. In all the head of the bone may generally, with a little care and patience, be perceived by the touch in its abnormal position, especially in thin persons, and before the occurrence of much swelling, rolling about when the leg is rotated upon its axis. The great points to be attended to, when there is any doubt respecting the diagnosis, are, the state of the limb as to the change in its length, axis, and movements; the position of the great trochanter, especially its distance from the anterior superior spinous process of the ilium; and the location of the head of the bone and our ability or inability to feel it in its new situation. All that the surgeon has to do is to give proper heed to these considerations, and he will seldom be long in doubt as to the true character of the injury. The investigation will, of course, always be materially facilitated by the use of chloroform.

When all the ordinary means, such as the most thorough and patient examination with the touch, sight, and mensuration, fail, the mystery may often be solved with the exploring instrument, inserted at various points of the hip, and moved about in different directions in search of osseous prominences and depressions. A long, slender needle, sinking in to a great depth in the natural situation of the acetabulum, would infallibly declare the absence of the head of the thigh-bone, as the existence of an unusual osseous tumor outside of that cavity would certainly indicate the location of that bone in its new position. As there are no important vessels or nerves in and about the hip, such a procedure would be entirely free from the danger of hemorrhage and even pain. My opinion, however, is that, although perfectly safe and easy, it will rarely be necessary in any case, the nature of the lesion being generally too well marked to elude detection.

GENERAL REMARKS ON THE REDUCTION OF DISLOCATIONS OF THE HIP-JOINT.

Having already described what in my opinion is the most unexceptionable method of reduction in the iliac dislocation, it is only necessary to add that the same mode of treatment is applicable to the other varieties. I restored by this method, many years ago, with the greatest facility, a sciatic luxation of seventeen days' standing, and quite a number of instances have been reported in which it was successfully employed in the thyroid and pubic forms of the accident. Indeed there can no longer be any doubt that it is the only true method in all dislocations of the hip-joint, the only exception being in chronic cases; but even here it will probably be found that it will generally answer, provided it is applied in a proper manner, and with the requisite degree of patience and perseverance. In an iliac displacement of one month's duration, under my care in 1855, in a stout, muscular man, aged twenty-two, I succeeded perfectly, by manipulation alone, after complete failure with the pulleys employed for nearly an hour and a half, the patient being all the while thoroughly relaxed by chloroform. In 1863 I promptly reduced, by similar means, a dislocation of twenty-seven days' standing in a lad fourteen years old.

In the pubic and thyroid dislocations, reduction has occasionally been effected by the heel in the perineum, the patient and surgeon lying in opposite directions, as in luxations of the shoulder. The pelvis being thus firmly fixed by the foot, extension is made by grasping the leg above the ankle, the limb being gradually carried over the sound one as the head of the bone approaches the cotyloid cavity. Or, instead of this, the leg may be flexed at a right angle with the knee, and a long, stout noose secured round the lower part of the thigh, and thrown over the operator's neck and shoulder, which will thus afford him much greater control over the limb. This method, however, which recommends itself by its simplicity, is applicable only in very thin, feeble subjects, offering but little muscular resistance.

In the dislocation into the thyroid foramen, Dr. Brainard has suggested a plan which seems to be worthy of constant trial. It consists in placing a piece of wood, properly padded, as a fulcrum, into the perineum, between the thighs, which are then used as levers, the knees being extended during the operation, and the limbs closely approximated, or even slightly crossed. In this manner he has promptly succeeded in effecting reduction in four cases, in one of them after the fruitless employment of the pulleys and Jarvis's adjuster. The diameter of the fulcrum should not, on an average, exceed four inches and a half, otherwise it might prevent the head of the femur from rising out of its abnormal position, and thus endanger the occurrence of fracture of its neck.

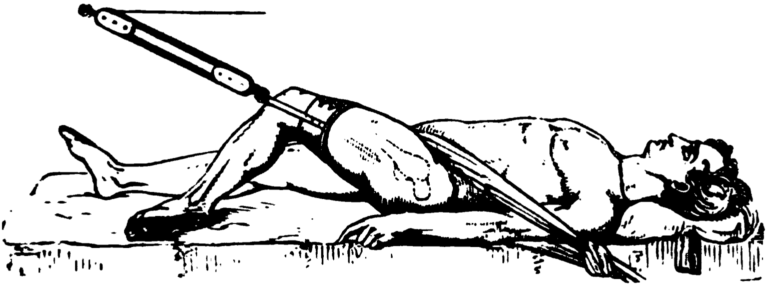
Sometimes the reduction may be effected by placing the patient upon his back in bed, with one of the posts between his thighs, close up to the perineum. The limb on the affected side should then be carried inwards, across the median line, so as to force the head of the bone out of its unnatural position. Care must be taken not to raise the post, otherwise the femur may be thrown into the sciatic notch. In this manner the bedpost acts as a fulcrum, and the thigh as a lever.

When manipulation fails, as it occasionally will, especially in very stout, robust persons, and in cases of a chronic character, recourse must be had to the pulleys, for then even severe measures would be preferable to leaving the luxation unreduced, and letting the patient remain a cripple for life. The general principles which should guide the practitioner in the use of these instruments have already been pointed out. I shall, therefore, limit myself here to a brief description of the operation as applicable to the several varieties of dislocations of the hip.

The patient should be laid upon his back on the floor, or on a firm table, lounge, or bed, between two strong objects, from ten to twelve feet apart, in each of which a large hook is fixed. A stout, soft piece of muslin, neatly folded, and at least four yards in length, is placed in the perineum, and being carried over the groin and buttock, its ends are tied together, and fastened to the hook behind the patient's head. Another band is carried round the upper part of the pelvis, and given to an assistant, to prevent the injured hip from being drawn down during the operation. Finally, a large wet napkin is rolled round the lower part of the thigh, and over this is buckled a leather band, with two lateral straps provided each with a ring. Or, instead of the band, a stout fillet is employed, being fastened by means of a wet roller, or the French knot, the ends being so disposed as to come down on each side of the knee, a little below which they are to be tied. The knee being now bent nearly at a right angle, and inclined a little across its fellow, the pulleys, secured to the extending band and the staple, are put in motion by gently drawing the cord. As soon as the apparatus is thoroughly put upon the stretch, and the patient begins to evince symptoms of suffering, as he will be sure to do if he has not taken chloroform, the efforts are to be relaxed, to allow the muscles time to become fatigued. After having waited a few minutes, the cord is again tightened, so as to increase the tension a little further, when the efforts are to be again intermitted. Taking care to proceed in this slow, gentle, and gradual manner, until the head of the femur has reached the edge of the acetabulum, the surgeon intrusts the management of the cord to an assistant, while he himself, grasping the upper part of the leg, rotates the limb in a direction contrary to that of its displacement, and thus promotes the return of the bone to its socket, the reduction being generally indicated by a distinct snap. When the head of the bone hitches against the brim of the acetabalum, its disengagement may be materially facilitated by means of a fillet placed round the groin, and thrown over the operator's neck and shoulder, so as to enable him to lift the bone up to a level with the cotyloid cavity, into which it will then be drawn by the contraction of the muscles. The length of time during which the action of the pulleys is to be maintained must depend upon circumstances; in some cases the restoration is effected in a few minutes, in others not under several hours.

The annexed cut, fig. 64, illustrates the position of the patient during the operation, the arrangement of the pulleys and extending bands, and the position of the limb.

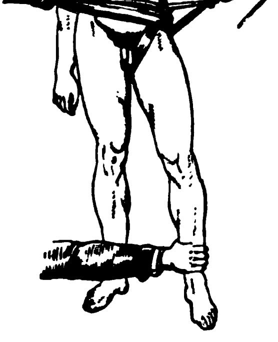
Fig. 64.



Reduction with the pulleys.

In the iliac and sciatic dislocations the rule is to let the patient lie on his back, and, after the extension and counter-extension have been kept up for some time, to carry the affected limb across the opposite one, as this enables the head of the bone the more easily to disengage itself from the brim of the pelvis. In the thyroid and pubic varieties the extension is directed downwards and backwards, the foot of the affected limb being carried behind the sound one, and the patient lying upon the uninjured side. The manner of conducting the proceeding is represented in figs. 65 and 66.

Fig. 65.

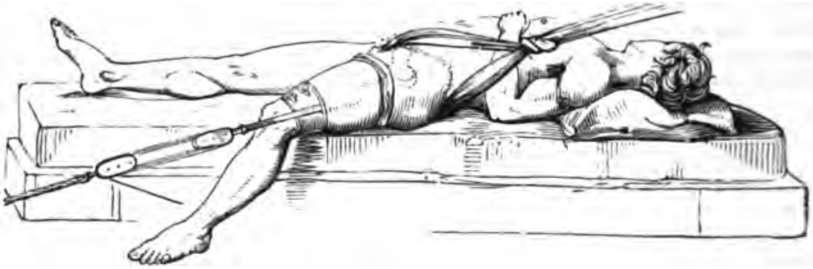


Reduction of the thyroid dislocation.

In our attempts at reduction, it occasionally happens that the head of the bone, instead of returning to its socket in the act of being lifted out of its abnormal position, drops into some other, from which it is found to be more difficult to dislodge it than it was in the first instance. This accident is most liable to occur in the iliac luxation, which, as the head of the femur is moved about to disengage it from the iliac fossa, is readily converted into the sciatic. Occasionally the pubic displacement is changed into the thyroid; and an instance happened some years ago at the Pennsylvania Hospital, in the service of Dr. Neill, in which, during the reduction, the bone was thrown out of the thyroid foramen into the sciatic notch, from which it was afterwards returned with great difficulty by means of the pulleys. These accidents are generally unavoidable; but a knowledge of the possibility of their occurrence should put the surgeon upon his guard, that he may not be deceived under an idea that he has effected reduction when he has only succeeded in producing another displacement.

When the head of the bone has resumed its original position, as may always be known by the disappearance of the symptoms, and by a comparison of the limb with that of its fellow, a return of the accident is to be prevented by keeping the thighs close together by means of a handkerchief or strip of bandage tied just above the knees. Recumbency will be necessary for at least three weeks; and during the first eight or ten days the hip should be kept constantly covered with cloths wrung out of a strong solution of acetate of lead and laudanum. If the inflammation run high, leeches, active purgation, the antimonial and saline mixture, and even general bleeding may be demanded. After the morbid action has measurably subsided, sorbefacient lotions, and passive motion of the joint will be required, to promote the removal of plastic matter, and prevent anchylosis.

Fig. 66.



Reduction of the pubic dislocation.

It is seldom that any of the luxations of the hip recur after the bone has been properly replaced, for such is the depth of the acetabulum and the nice adaptation of the head of the femur as to render an event of this kind extremely difficult after recovery from the immediate effects of the injury. A remarkable instance, however, occasionally occurs, in which the same displacement happens frequently in pretty rapid succession in the same person. Thus, Mr. John F. South gives the case of a woman, who, in the space of thirteen years, dislocated her femur upwards and backwards upon the ilium not less than twenty-one times; latterly from so trivial a cause as stooping, or turning in bed. The accident originally happened when she was twenty-four years old, from slipping on a piece of orange-peel.

In this case the frequent recurrence of the displacement was no doubt due to extensive rupture of the ligaments of the joint; but now and then it is found to depend upon fracture of the border of the cotyloid cavity. However induced, the accident is always to be deplored because it is generally irremediable.

ANOMALOUS DISLOCATIONS OF THE HIP-JOINT.

The hip, like the shoulder, is subject to certain forms of displacement, to which, from the infrequency of their occurrence, the term rare, irregular, or anomalous may be applied. They are perhaps, for the most part, merely exaggerated states of the more ordinary varieties of the accident, as will be rendered evident from the annexed account, comprising a succinct outline of the principal reported cases. In a majority of these the head of the femur was thrown downwards against some portion of the ischium; in one it was lodged in the perineum, and in one it was pushed upwards and inwards against the ilium, lying in the space between its two anterior superior spinous processes.

In a case which happened to Mr. Robert Keate, the head of the bone lay close to, and on a level with, the tuberosity of the *ischium*, where it could be distinctly felt rolling about under the finger on moving the thigh, which was more than three inches longer than natural, much flexed upon the pelvis, and widely separated from the sound one. The leg was greatly bent, the foot much everted, and the large trochanter extremely sunk. By drawing the upper part of the femur outwards, and pressing the knee sharply inwards, the head of the bone returned to its natural place with a decided snap. Immediately afterwards, however, the limb could be elongated by slight traction, inducing the belief that a portion of the cartilaginous rim of the acetabulum had been broken off in the accident, which had been caused by the man falling from his horse into a deep, narrow ditch, the animal tumbling backwards upon him.

In a case described by Mr. Wormald, the head of the femur rested upon the upper part of the *tuberosity* of the ischium, above the quadrate muscle. The accident, caused by a leap from a third-story window, was attended with other injury, which soon proved fatal. The head of the bone was easily recognized in its new situation. The limb, considerably shortened and inverted, formed half a right angle with the body, and the shaft of the femur, crossing the pubic symphysis, was immovably fixed in this position.

Mr. Earle was called to a case where the head of the bone lay upon the *spine* of the ischium; the limb was lengthened about half an inch, but there was neither eversion nor inversion; the trochanter was farther back and less prominent than natural; an extraordinary vacuity existed in front of the hip; and the outline of the sartorius and tensor muscles was uncommonly distinct, their edges being tense and almost sharp.

Dr. Kirkbride met with an instance where the head of the femur was thrown upon the posterior part of the *body* of the ischium, between its tuberosity and spine. The thigh lay across the sound one, the leg was flexed, the limb was lengthened at least an inch, and the interval between the great trochanter and the anterior superior spinous process of the ilium was much increased. Rotation was difficult, and extension impossible. The head of the bone was easily felt in its new situation. The accident was caused by a fall from a considerable height, in which the body was crushed by a heavy piece of timber. The reduction was effected by the pulleys, but not without difficulty, for the man was very muscular, and the bone was firmly impacted.

Dr. J. M. Warren has seen two cases in which the head of the bone rested against the ascending *ramus* of the ischium, the thigh projecting out laterally at a right angle with the trunk. A deep hollow existed at the spot naturally occupied by the great trochanter. The reduction was effected, in one case, by manipulation, in the other, by the pulleys.

Dr. Willard Parker has reported a case of dislocation of the femur into the *perineum*, in a man, aged thirty-five, who was injured in calking a boat, his body being bent strongly forwards and his feet widely separated. While in this position, the boat fell upon him, throwing him down by the side of the timber over which he had been standing, so as to force the right thigh between it and the bottom of the vessel. When extricated from this position, the limb was found to project at a right angle with the trunk, the nates being flattened, and the toes turned slightly inwards. The head of the bone, upon rotating the thigh, could be distinctly felt in the perineum behind the scrotum, near the bulb of the urethra. The reduction was readily effected by confining the pelvis and extending downwards and outwards, aided by moderate rotation. In this way the head of the bone was made to ascend over the ramus of the pubes into the thyroid foramen, from which it was afterwards conducted into the acetabulum by carrying the limb across the sound one.

A case similar to the above occurred to Dr. Pope, of St. Louis, in a man, aged forty, who had his body crushed by the caving in of a bank of earth, at a moment when he was standing in a bent position, with his limbs widely separated. The thigh, inclined somewhat forwards, formed a right angle with the body, the head of the bone being felt under the skin of the raphe of the perineum. The accident was associated with fracture of the leg and arm. Reduction was effected with the pulleys, the bone returning with a loud snap.

Several cases have occurred in which the head of the femur was dislocated upwards and inwards into the space between the two anterior *spinous processes*. In one, examined by Mr. Morgan, the bone, lying in this precise spot, could be distinctly felt under Poupart's ligament, upon the brim of the pelvis. The prominence of the great trochanter was entirely lost, the thigh was shortened at least two inches, the toes were excessively everted, and the injured limb had a tendency to cross the sound one. Rotation was impossible, but all the other motions could be performed, though only in a limited degree, and not without great pain. Reduction was easily effected. A similar case has been described by Mr. Travers: it was caused by a fall from a height of twenty feet, in which the left buttock struck upon a coil of chain cable. Here, however, the neck, and not the head of the bone, lay between the two anterior spinous processes, the head not being perceptible. The left nates was flattened, and the limb, shortened and everted, had the appearance, when the patient stood erect, of being suspended from the anterior and lateral part of the ilium. A little below and to the outer side of this point was the great trochanter, easily distinguished by the finger.

In 1858, a case occurred to Mr. Luke, in which the head of the bone was lodged midway between the thyroid hole and the ischiatic notch, immediately beneath the lower border of the acetabulum. The limb was lengthened one inch, without eversion or inversion, and the head of the bone was easily felt in its new position. The reduction was accomplished without difficulty. The man died from the effects of other injuries, the dislocation was reproduced in the dissection of the joint. The inferior gemellus and square femoral had been torn, the lower part of the capsular ligament had given way, and the round ligament was completely detached. The patient, a stout man, fifty years of age, had been hurt by a fall into a dry-dock.

Finally, Dr. E. W. Hodder, of Toronto, has recorded the case of a man, aged twenty-two years, in which the head of the femur was thrown under the *arch of the pubes.* The accident was caused by a large quantity of earth falling upon the loins and hips. The bone could easily be felt in its abnormal position, and the thigh, as the patient stood up, formed nearly a right angle with the trunk. The knee was everted, a remarkable concavity existed upon the dorsum of the ilium, the psoas and iliac muscles were very tense, and the great trochanter could scarcely be felt. The affected limb, was, if anything, a little longer than the sound one.

The above cases will serve as types of most of those anomalous forms of ilio-femoral dislocations that will be likely to occur in practice. The symptoms are usually prominent, if not positively characteristic. The treatment must be conducted according to the general principles which guide the practitioner in the management of the ordinary varieties of luxation of the hip-joint. Manipulation alone will frequently suffice to effect reduction, as there is always necessarily extensive rupture of the soft parts; when greater force is required, recourse must be had to the pulleys. In some of the cases above mentioned, the restoration was effected by a kind of compound process, the dislocation being first changed into a common one, from which the head of the bone was afterwards returned to its natural position by a secondary effort.

CHRONIC DISLOCATIONS OF THE HIP-JOINT.

Chronic dislocations of the hip-joint are occasionally brought under the observation of the surgeon, and the question, therefore, necessarily arises, when should such displacements be considered as irreducible? It has been seen elsewhere that Sir Astley Cooper asserts that, as a general rule, it is imprudent to attempt restoration after the eighth week, except in persons of a debilitated frame, or very lax habit of body; and most English and American surgeons, adopting this view, have inculcated similar precepts. I believe this opinion to be in the main correct, and it may even be assumed that there are not a few cases which will resist all efforts at reduction long before the expiration of this period. In an especial manner is this true of the dislocations backwards into the sciatic notch and downwards into the thyroid foramen, in which the head of the femur becomes much sooner firmly and immovably fixed in its new position than in the iliac and pubic varieties. Sir Astley Cooper himself admits the existence of exceptions, and he has published the particulars of a case of luxation, upon the dorsum of the ilium, reduced after the lapse of five years. Numerous instances of a similar purport, only of much shorter duration, have been narrated by other writers, all tending to show that there are circumstances in which reduction may be hoped for after a joint has been out of place for several months.

It is not necessary to repeat here what has elsewhere been insisted upon in regard to the considerations which should influence the surgeon in the choice of his cases; or, in other words, the circumstances which should induce him to attempt or decline interference. Full instruction has already been given upon this subject, and yet, in view of its paramount importance, it may not be amiss to subjoin a few remarks, if it be only for the purpose of insuring greater care and caution.

The circumstances which may usually be considered as forbidding any efforts at restoration are, first, the absence of mobility in the luxated bone; secondly, occlusion of the acetabulum by fibrinous deposits; and, thirdly, great disorder of the general health, rendering it probable that the system could not withstand the shock and irritation following the operation.

The first of these points can usually be determined by moving the limb about in different directions, and watching the degree of displacement suffered by the femur. The examination should be conducted by taking hold of the knee, or, better still, of the knee and ankle, and it will be most efficient if, while the limb is rotated, or attempted to be rotated, the hand is applied to the head of the luxated femur. When there is no motion, or motion only in a limited degree, it may be assumed that the adhesions are too strong to admit of rupture without risk of serious injury to the parts.

It is not always, indeed not generally, easy to determine whether the acetabulum has been filled up or not by plastic deposits. The probability of such an occurrence may be inferred if the accident has been followed by severe inflammatory action, if the parts have ceased to be tender on pressure, and if the head of the bone has contracted firm adhesions to the surrounding tissues. If any doubt remain, the exploring needle might be used, its point being carried about in different directions, to ascertain the amount and consistence of the obstructing substance.

It may be stated that, other things being equal, the acetabulum will be filled up much sooner in young, robust subjects than in the aged and feeble, and that, as a general rule, the likelihood of its being so is always in proportion to the length of time that has elapsed since the occurrence of the displacement.

Finally, the patient's health may be so much reduced as imperatively to prohibit all attempts at reduction, not on account of any pain that might be experienced, for chloroform would effectually prevent that, but because so much violence might be done in the operation as to cause the most intense inflammation and constitutional irritation, placing life in imminent peril.

When it is deemed advisable to undertake the treatment of such cases, it will generally be necessary to use the pulleys, subject to the rules and regulations already laid down for their employment; but sometimes the object may readily be attained, or, at all events, without much difficulty, simply by manipulation. Thus, Dr. Dupierris, of Havana, met with a case of iliac luxation of six months' standing, in which he succeeded most satisfactorily by this method alone; and a number of instances of a character nearly equally remarkable have occurred in the practice of other surgeons. Such examples are full of instruction, and deserving of the most attentive consideration, conveying, as they do, a highly valuable practical lesson. Nevertheless, they must be regarded merely as exceptions, nothing more: to view them as rules would be to contravene the laws of morbid action, and would, practically, lead to the worst results.

Finally, a case has occasionally occurred in which, in an attempt to reduce a chronic dislocation of the hip-joint, the femur has given way at its neck within the capsular ligament, and such an accident has been known to be followed by a good use of the limb. An instance of this kind fell under my observation in 1861, in consultation with my colleague, Professor Pancoast, in a gentleman between thirty-five and forty years of age. The head of the femur lay upon the iliac bone, the displacement having occurred nearly three months previously.

two inches, the toes were excessively everted, and the injured limb had a tendency to cross the sound one. Rotation was impossible, but all the other motions could be performed, though only in a limited degree, and not without great pain. Reduction was easily effected. A similar case has been described by Mr. Travers; it was caused by a fall from a height of twenty feet, in which the left buttock struck upon a coil of chain cable. Here, however, the neck, and not the head of the bone, lay between the two anterior spinous processes, the head not being perceptible. The left nates was flattened, and the limb, shortened and everted, had the appearance, when the patient stood erect, of being suspended from the anterior and lateral part of the ilium. A little below and to the outer side of this point was the great trochanter, easily distinguished by the finger.

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The above cases will serve as types of most of those anomalous forms of ileo-femoral dislocations that will be likely to occur in practice. The symptoms are usually prominent, if not positively characteristic. The treatment must be conducted according to the general principles which guide the practitioner in the management of the ordinary varieties of luxation of the hip-joint. Manipulation alone will frequently suffice to effect reduction, as there is always necessarily extensive rupture of the soft parts; when greater force is required, recourse must be had to the pulleys. In some of the cases above mentioned, the restoration was effected by a kind of compound process, the dislocation being first changed into a common one, from which the head of the bone was afterwards returned to its natural position by a secondary effort.

CHRONIC DISLOCATIONS OF THE HIP-JOINT.

Chronic dislocations of the hip-joint are occasionally brought under the observation of the surgeon, and the question, therefore, necessarily arises, when should such displacements be considered as irreducible? It has been seen elsewhere that Sir Astley Cooper asserts that, as a general rule, it is imprudent to attempt restoration after the eighth week, except in persons of a debilitated frame, or very lax habit of body; and most English and American surgeons, adopting this view, have inculcated similar precepts. I believe this opinion to be in the main correct, and it may even be assumed that there are not a few cases which will resist all efforts at reduction long before the expiration of this period. In an especial manner is this true of the dislocations backwards into the sciatic notch and downwards into the thyroid foramen, in which the head of the femur becomes much sooner firmly and immovably fixed in its new position than in the iliac and pubic varieties. Sir Astley Cooper himself admits the existence of exceptions, and he has published the particulars of a case of luxation, upon the dorsum of the ilium, reduced after the lapse of five years. Numerous instances of a similar purport, only of much shorter duration, have been narrated by other writers, all tending to show that there are circumstances in which reduction may be hoped for after a joint has been out of place for several months.

It is not necessary to repeat here what has elsewhere been insisted upon in regard to the considerations which should influence the surgeon in the choice of his cases; or, in other words, the circumstances which should induce him to attempt or decline interference. Full instruction has already been given upon this subject, and yet, in view of its paramount importance, it may not be amiss to subjoin a few remarks, if it be only for the purpose of insuring greater care and caution.

The circumstances which may usually be considered as forbidding any efforts at restoration are, first, the absence of mobility in the luxated bone; secondly, occlusion of the acetabulum by fibrinous deposits; and, thirdly, great disorder of the general health, rendering it probable that the system could not withstand the shock and irritation following the operation.

The first of these points can usually be determined by moving the limb about in different directions, and watching the degree of displacement suffered by the femur. The examination should be conducted by taking hold of the knee, or, better still, of the knee and ankle, and it will be most efficient if, while the limb is rotated, or attempted to be rotated, the hand is applied to the head of the luxated femur. When there is no motion, or motion only in a limited degree, it may be assumed that the adhesions are too strong to admit of rupture without risk of serious injury to the parts.

It is not always, indeed not generally, easy to determine whether the acetabulum has been filled up or not by plastic deposits. The probability of such an occurrence may be inferred if the accident has been followed by severe inflammatory action, if the parts have ceased to be tender on pressure, and if the head of the bone has contracted firm adhesions to the surrounding tissues. If any doubt remain, the exploring needle might be used, its point being carried about in different directions, to ascertain the amount and consistence of the obstructing substance.

It may be stated that, other things being equal, the acetabulum will be filled up much sooner in young, robust subjects than in the aged and feeble, and that, as a general rule, the likelihood of its being so is always in proportion to the length of time that has elapsed since the occurrence of the displacement.

Finally, the patient's health may be so much reduced as imperatively to prohibit all attempts at reduction, not on account of any pain that might be experienced, for chloroform would effectually prevent that, but because so much violence might be done in the operation as to cause the most intense inflammation and constitutional irritation, placing life in imminent peril.

When it is deemed advisable to undertake the treatment of such cases, it will generally be necessary to use the pulleys, subject to the rules and regulations already laid down for their employment; but sometimes the object may readily be attained, or, at all events, without much difficulty, simply by manipulation. Thus, Dr. Dupierris, of Havana, met with a case of iliac luxation of six months' standing, in which he succeeded most satisfactorily by this method alone; and a number of instances of a character nearly equally remarkable have occurred in the practice of other surgeons. Such examples are full of instruction, and deserving of the most attentive consideration, conveying, as they do, a highly valuable practical lesson. Nevertheless, they must be regarded merely as exceptions, nothing more: to view them as rules would be to contravene the laws of morbid action, and would, practically, lead to the worst results.

Finally, a case has occasionally occurred in which, in an attempt to reduce a chronic dislocation of the hip-joint, the femur has given way at its neck within the capsular ligament, and such an accident has been known to be followed by a good use of the limb. An instance of this kind fell under my observation in 1861, in consultation with my colleague, Professor Pancoast, in a gentleman between thirty-five and forty years of age. The head of the femur lay upon the iliac bone, the displacement having occurred nearly three months previously.

There was great lameness, accompanied with much deformity, and, as the patient was very anxious for relief, he was accordingly chloroformized and subjected to the use of the pulleys, as well as to manipulation. During the progress of our efforts, the bone suddenly broke at its neck, and the result was a very good use of the limb, the patient being able in a few weeks to move it in every direction instead of being obliged to hold it in the stiff and unseemly position in which it had been previously. The shortening did not exceed two inches.

It would certainly not be advisable to adopt such a procedure as a rule of practice, and yet it is worthy of consideration whether, in cases of irreducible dislocations, attended with great deformity, and a useless condition of the limb, it would not be proper. The patient here alluded to did not seem to suffer any pain from the accident, and he was certainly highly gratified with the result. It is to be borne in mind that, from the softening which the articular extremities of the bones undergo in old and neglected luxations, such a fracture is a comparatively easy and simple occurrence, not necessarily followed by serious inflammation. Without such an effort, it is evident that the patient must remain a cripple for life.

CONGENITAL DISLOCATIONS OF THE HIP-JOINT.

Congenital luxation of the hip-joint is very uncommon. Females are more liable to it than males, and it is also more common in scrofulous than in healthy children. Of forty-five cases reported by Dupuytren and Pravaz, only seven were males; a disproportion which it is impossible to suppose to have been altogether accidental. The immediate causes of this variety of displacement are, first, shortness, total absence, or extreme obliquity of the neck of the thigh-bone; secondly, partial or entire obliteration of the cotyloid cavity; and, thirdly, deficiency, extraordinary elongation, or complete absence of the round ligament.

The characters of the malformation are, shortening of the affected limb, unnatural projection of the great trochanter, ascent of the head of the femur into the iliac fossa, inversion of the leg, and obliquity of the pelvis. The motions of the joint, particularly those of abduction and rotation, are constrained and imperfect; the muscles of the upper part of the thigh are retracted, or drawn towards the iliac crest; the limb is thin, wasted, and out of all proportion to the rest of the body; the tuberosity of the ischium is almost uncovered, and consequently unusually prominent; the upper part of the trunk is thrown backwards, while the lumbar portion of the spine projects forwards, being concave behind; the pubes is placed almost horizontally on the thighs; and the ball of the foot alone touches the ground when the child stands erect.

In the recumbent posture, when the weight of the trunk is taken off, and the muscles are relaxed, most of the symptoms of the luxation disappear, and the limb may be shortened or elongated at pleasure. In walking, the body is inclined towards the sound side, and the head of the dislocated bone sinks towards the cotyloid cavity by its own weight. As age advances, the limb becomes shorter, in consequence of the femur ascending higher and higher on the ilium; the obliquity of the pelvis augments; and the power of locomotion, already so much impaired, is completely destroyed.

Congenital dislocation of the hip-joint may, in general, be easily distinguished from other accidents or maladies, by the affection being observed at or soon after birth, by the obliquity of one or both thighs; by the absence of pain, swelling and ulceration; by the head of the femur being displaced without any external violence; and by the ability of the surgeon to lengthen or shorten the limb at pleasure. In disease of the hip there is always more or less pain, with a feverish state of the system, and gradual failure of the strength; the parts about the joint are tense and swollen; the limb, at first somewhat lengthened, becomes afterwards shortened, and cannot be extended without the greatest suffering; and the motions of the ileo-femoral articulation are permanently impaired.

The pathological appearances vary. In general, the cotyloid cavity is partially obliterated, or entirely deficient, being replaced by a small, irregular osseous prominence, devoid of cartilage and synovial membrane; the head of the femur, often flattened at its antero-internal aspect, rests in a kind of superficial fossa on the dorsal surface of the ilium; the round ligament, as was before remarked, is elongated, partially worn away, or even altogether absent; and the surrounding muscles are either atrophied, transformed into a yellowish, fatty, fibrous tissue, or preternaturally developed. In the latter case, their action is preserved; in the former, it is very much restricted, or totally annihilated.

The prognosis is always unfavorable, as the patient either dies young, or remains permanently lame and deformed.

The *treatment* of congenital dislocation of the hip-joint can generally be little more than palliative. In cases of recent standing, permanent extension, by means of Desault's fracture apparatus, or some other suitable contrivance, may be tried with a prospect of advantage, though seldom with a hope of permanent cure. When both joints are involved, the patient should be kept for a long time in the recumbent posture, in order to take off the weight of the body from the limbs, as this is the main agent in aggravating the displacement. As an important auxiliary measure, recourse may be had to the shower-bath, followed by dry-friction, or friction with ammoniated and other stimulating liniments. The pelvis may be encircled with a broad, well-padded belt, so as to steady the trochanters, and counteract the tendency of the thigh-bones to ascend towards the iliac crests. If debility exist, tonics will be required, especially quinine and some of the preparations of iron.

CHAPTER II.

INJURIES AND DISEASES OF THE HEAD.

INJURIES of the head have always been objects of the deepest interest and study with the surgeon. Independently of the frequency of their occurrence they merit the greatest attention, on account of the obscurity of their diagnosis, the stealthy character of their progress, the difficulty of their management, and the uncertainty of their termination. It was long ago remarked by Mr. Pott, and the observation has been verified a thousand times since, that there is no lesion of the head so trifling, on the one hand, as not to endanger life, or so severe, on the other, that it may not be followed by recovery.

SECT. I.—LESIONS OF THE SCALP.

1. WOUNDS.

Wounds of the scalp exhibit the same general features as wounds in other regions. The only real difference is their great liability to be followed by erysipelas, neuralgia, arachnitis, cerebritis, and various other secondary affections.

Incised wounds, whatever may be their extent or depth, should always be treated with reference to the production of immediate reunion. With this view, as soon as they have been divested of blood and foreign matter, their edges should be carefully approximated with a suitable number of twisted sutures, care being taken to carry the ligatures from one pin to another, so as to obviate the necessity for the application of adhesive plaster, which, while it always adheres badly, and never can be used without extensive shaving of the scalp, very frequently predisposes to the occurrence of erysipelas. When the cut is very slight, contact may often be effectually maintained by tying together at their base a few little locks of hair on each side of it; the threads should be very fine, and well waxed, otherwise it will be difficult for them to retain their hold until the adhesive process is sufficiently advanced to admit of their removal. When the wound is very large, the scalp should always be well shaved, as a preliminary step, but under opposite circumstances such a precaution will, in general, be entirely unnecessary.

It is difficult, at this day, to conceive why so much opposition should have been made in former times to the use of sutures in wounds of the scalp. In reading the accounts of some of the older surgeons of this mode of treatment, one is almost tempted to conclude that they must have thought that there was something peculiarly poisonous in it; a violent war was waged against it for nearly half a century, and it is questionable whether its influence has yet altogether disappeared. However this may be, it cannot be doubted that sutures of the scalp, in whatever form they may be used, are as harmless as any mode of dressing, of which it is possible to form any conception. If they were formerly a source of irritation, a circumstance which can hardly be denied, the occurrence was in all probability due to the coarseness of their material, and the manner of their introduction. These objections certainly do not exist at the present day, and no one who has once tried them in this situation will ever be likely to dispense with them. These remarks are particularly applicable to the twisted suture, which, in addition to the benefit already ascribed to it, has the advantage of compressing the orifices of the divided vessels, and of thus effectually controlling hemorrhage. It has occurred to me again and again to see the edges of a wound in the scalp, approximated simply with adhesive plaster, forced apart, and prevented from uniting, by the interposition of coagulated blood. When the twisted suture is properly made, no other dressing whatever is needed; the part is constantly exposed to view, and the moment any change of an untoward character arises it is detected, which it cannot be when the ordinary retentive means are employed. The pins should not be withdrawn before the fourth or fifth day. The best material for the interrupted suture is silver wire.

Lacerated wounds of the scalp are generally caused by blows or falls on the head, or by the passage of the wheel of a carriage. One of the most severe and extensive injuries of this kind that I have ever witnessed was inflicted by the horns of an infuriated cow. Owing to the manner in which they are produced, more or less foreign matter is usually entangled in these wounds, and for the same reason they are often followed by violent inflammation, suppuration, and even gangrene. The rule of treatment is the same as in incised wounds, but special care should be taken not to draw the edges so firmly together, lest the resulting swelling, which will always be considerable, should induce undue tension, and thus necessitate the premature detachment of the sutures. The scalp, too, should always be pretty extensively shaved, and cold water-dressings should be freely used, to prevent the untoward occurrences adverted to. With proper attention, it is surprising how much of the wound may, even in apparently the most unpromising cases of this kind, unite by the first intention.

A *punctured wound* of the scalp, apart from its tendency to erysipelas and suppuration, is usually a very simple affair. The proper remedy is the cold water-dressing, simple or medicated; and, if inflammation run high, the application of leeches, followed by emollient poultices. If matter form, or even if there is merely severe tension, appropriate incisions are made.

In *contused wounds*, the rule is, after thorough shaving of the scalp, and the removal of foreign matter, to approximate the edges very lightly with the interrupted suture, aided, if necessary, by a few strips of adhesive plaster. Proper allowance is made at the start for swelling and tension, which are often severe. If the edges are shreddy, or tattered, they are neatly trimmed with the scissors, but in no case should any flaps, even if violently bruised and apparently dead, be cut off; for no one can ever positively determine, beforehand, whether such a part is really deprived of vitality or not, and it is best, therefore, always to afford nature an opportunity of saving all she can. The leading indication is to circumscribe inflammation, and the best remedy for meeting it is the warm water-dressing, rendered slightly stimulating by the addition of a small quantity of laudanum, alcohol, or spirits of camphor. In this way an attempt is made to impart tone to the contused vessels and nerves, to enable them more effectually to withstand the effects of inordinate action. Pencilling the surface immediately around the wound with a weak solution of iodine or nitrate of silver is sometimes beneficial.

Contusions, properly so termed, of the scalp present themselves in various degrees, from the slightest bruise, as it is vulgarly called, to a mashed, softened, and pulpified condition of its component elements. They may be superficial or deep-seated, circumscribed or diffused, simple or complicated. Their tendency, even when slight, is to terminate in violent inflammation, especially of the erysipelatous variety, in abscess, and even in gangrene. Such events will, of course, be most likely to happen in persons of intemperate habits, or of a broken-down constitution, though the most healthy individuals do not always, indeed—perhaps, not generally—escape them. Another effect of a severe contusion of the scalp, is its liability to produce mischief in the brain and its membranes. Two circumstances suggest themselves as likely to bring about this state of things. The first is the shock sustained by the cranial contents by the violence of the blow inflicting the contusion, and the other, the disposition in the resulting inflammation to extend to the meninges through the vessels and fibres of the pericranium. Accidents of this kind are occasionally complicated with fracture of the skull, detachment of the dura mater, or concussion of the brain. Sometimes, again, a portion of bone is merely bruised, and yet the action consequent upon the lesion is so great as ultimately to cause its death. When the contusion is at all severe, there is usually a considerable effusion of blood, presenting itself generally in the form of a circumscribed tumor; in rare cases the blood is widely diffused, extending, in fact, nearly over the whole head.

Contusions of the scalp, however slight, should always be regarded as accidents of grave import. The patient should be cautioned about his diet; the bowels should be properly regulated, and he should avoid premature exposure. Under this management, the affected parts will generally, in a very short time, be restored to their pristine condition, without, perhaps, the slightest topical medication, except the use of cold water, or some mildly astringent lotion. When the injury is more extensive, the warm water-dressing should be used, and its efficacy will usually be much increased by the addition of opium and hydrochlorate of ammonia, alcohol, or spirits of camphor. These ingredients are particularly valuable in such cases, not only by imparting tone to the affected tissues, but by promoting the absorption of extravasated blood, and can seldom be dispensed with. Warm applications are nearly always borne better, both by the scalp and the system at large, than cold, whether simple or medicated, and they are also much less likely to cause injurious metastasis to the brain and its membranes. In regard to this matter, however, the practitioner will always do well to consult the feelings of his patient. When the inflammation is at all severe, leeches will be demanded, especially if there is impending cerebral involvement, and they should be profusely scattered over the affected surface. Tension and swelling must be remedied by multiple punctures; abscesses must be opened early and freely, to relieve pain and prevent the diffusion of pus.

Wounds and contusions of the scalp are often followed by serious *secondary effects*. These consist, for the most part, of certain nervous symptoms, as numbness of the scalp, partial paralysis of the face, headache, muscular twitchings, strabismus, and neuralgic pains. Occasionally the scalp remains very tender at one particular point, a spot perhaps not larger than half a dime, so that the individual is unable to bear the slightest pressure of the finger, or even of his hat. At times again, these injuries are followed by epilepsy, abscess of the liver, and atrophy of the testes.

The treatment of these effects must be regulated upon general principles; by incision, and a profuse discharge of matter, if there is great tenderness, of a circumscribed character, depending upon chronic thickening of the periosteum; by anti-neuralgic remedies, when the pain is periodical, or of a dull, heavy, aching character; and by emetics, purgatives, and a properly regulated diet, when there is disorder of the digestive organs, with irregular action of the muscles. The cold shower-bath, change of air, and, in obstinate cases, slight but persistent ptyalism will be beneficial.

2. ABSCESSES.

Matter is liable to form upon the head in three different situations, in the subcutaneous cellulo-adipose tissue of the scalp, below the occipito-frontal muscle, and between the pericranium and the skull. Most generally it occurs in the first of these localities; least frequently in the last. The most common exciting cause is external injury, as a wound, blow, fall, or contusion. Sometimes the abscess arises spontaneously, but in the majority of cases, whatever may be the provocation, its formation is preceded and accompanied by erysipelatous inflammation, denotive of disorder of the general health, or of a vitiated condition of the secretions.

The *symptoms* of abscess of the scalp are generally well marked. The pain is severe, and of a throbbing, burning character; the swelling, which is either circumscribed or diffused, pits on pressure; and the surface presents an erysipelatous appearance. The concomitant inflammation often extends from the scalp to the eyelids and face, temples, ears, and nape of the neck. The constitutional involvement is generally considerable, and not unfrequently there is delirium at an early stage of the attack, especially when the pus is situated beneath the pericranium. Violent rigors sometimes mark the progress of the case.

The quantity of matter varies from a few drachms to several ounces. In a case which I recently attended with Dr. Quirner, in a child, eleven years of age, there was nearly half a pint of fluid, of a thick cream-like consistence. The abscess was situated on the vertex, and formed an immense projection under the detached and attenuated scalp.

The sensation which an abscess in this situation imparts to the finger is peculiar, particularly if some time has elapsed since its development. While the abscess itself freely fluctuates, and perhaps forms a pendulous bag, the base is generally remarkably hard, sharp, and precipitous, evidently from plastic deposits, feeling precisely as if it consisted of the rim of a depressed fracture. This feature is commonly so distinct, in circumscribed abscess of the scalp, that the surgeon, unless fully upon his guard, will be very likely to be deceived in respect to the true nature of the case. In diffused collections the base is less abrupt, and, therefore, the danger of mistake is not so great.

When the pus lies beneath the aponeurosis of the occipito-frontal muscle, it is generally very slow in reaching the surface, and often, in consequence, causes great mischief by its extensive diffusion, dissecting the parts freely from their natural relations, and forming a large, boggy, purulent bag, with a more or less well-defined boundary. An abscess beneath the pericranium, between it and the skull, usually presents itself as a small, puffy, circumscribed swelling, accompanied with considerable pain and tenderness; it generally follows upon a severe contusion, wound, or fracture, a number of days—not unfrequently as many as ten, twelve, or fourteen—after the accident, and is extremely liable to give rise to caries, if not necrosis, of the cranial bones, and inflammation of the brain and its membranes, from the destruction of the connecting vessels and the extension of the morbid action. If the patient die, pus will probably be found beneath the dura mater, which is at the same time more or less extensively separated from the bone, and in an unhealthy, sloughy condition. Such an abscess is always peculiarly dangerous, from its tendency to produce cerebral complications.

The *treatment* of these abscesses must be strictly antiphlogistic. Leeches, poultices, and water-dressings, medicated with acetate of lead and opium, are more particularly indicated in the earlier stages of the disease, along with the use of purgatives, attention to the secretions, and a proper regulation of the diet. The moment fluctuation is perceived, or, even before, if there is much tension, free incisions should be made. Cerebral symptoms are combated in the usual manner. If matter form beneath the skull, as indicated by the whitish or yellowish aspect of the bone, and disturbance of the brain, recourse must be had to trephining, although the operation will seldom be followed by any permanent benefit.

3. TUMORS.

The *sanguineous* tumor, as it is termed, is often met with on the scalp, generally as a consequence of blows, falls, kicks, and other injuries, the blood being extravasated into the subcutaneous cellular tissue, either in the form of a distinct swelling, or as an infiltration. The accident not infrequently happens during parturition, from the pressure on the child's head in its descent through the soft parts of the mother. Contusions of the scalp, however slight, or however induced, are always followed by sanguineous effusion. The blood may be situated immediately beneath the skin, below the aponeurosis of the occipito-frontal muscle, or beneath the pericranium, in direct contact with the bone. Varying in quantity from a few drachms to several ounces, it is of a fluid, semi-fluid, or solid consistence, and of a dark purple color, according to the period at which it is examined, or the circumstances under which it is extravasated. The most abundant accumulations of this kind usually occur at the sides of the head and the superior part of the occiput, in consequence, apparently, of the greater laxity and vascularity of the tissues there than elsewhere. Immense bags of blood are occasionally formed in both these situations, especially after falls and blows on the head, attended with the laceration of some of the branches of the temporal and occipital arteries.

When the tissues of the scalp have been much contused, the extravasated blood will seldom be found to be fully coagulated, and occasionally, in fact, it is even completely fluid, having apparently been deprived of its vitality at the moment of the accident. The same thing usually happens when the collection is very large, although the parts may have suffered comparatively little violence. If the blood is permitted to remain for any length of time, it undergoes changes similar to those witnessed in an apoplectic effusion; that is, it loses its dark color and soft consistence, and is converted into a grayish fibrinous mass, of varying firmness and density. On the other hand, it occasionally happens that all the solid matter is absorbed, and that all that remains is a pale serous, or oily-looking fluid. During the inflammation which supervenes upon these accidents, pus is sometimes poured out, and, mingling with the blood, imparts to it its peculiar appearance.

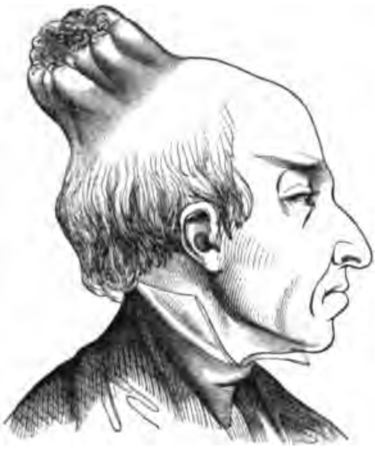
The tumor formed by the extravasated blood is either circumscribed and of a rounded or conical shape, or it is diffused and irregular, being, perhaps, flattened at one point and elevated at another. It is always soft and fluctuating at the beginning, and sometimes it even retains this feature throughout, though in most cases it soon becomes comparatively hard and firm, from the coagulation of its contents. When it is caused by external violence, as a blow or fall, it has occasionally a sharp, abrupt, and well-defined margin, and the finger, as it sinks into the centre of the swelling, receives an impression as if there were a fracture of the skull with depression of the bone, although nothing of the kind is present. The appearance of the skin is variable; but in general it is unchanged, being neither discolored, ecchymosed, nor œdematous. When inflammation arises, the tumor becomes hot, tender, and painful. In cases of long standing, the blood is sometimes surrounded by a distinct cyst, and, in the sub-pericranial form of the affection, the uplifted membrane has been known to undergo extensive ossification.

Accumulations of blood of the scalp, whether circumscribed or diffused, usually disappear, either spontaneously, or under very simple treatment, as refrigerant, astringent, and sorbefacient lotions, tincture of iodine, blisters, and leeches, the two latter being particularly indicated when the tumor is hot and inflamed. Mild purgatives will often be useful, and proper attention must be paid to the diet. In children, a very convenient and efficient remedy is a weak solution of hydrochlorate of ammonia in equal parts of vinegar and water. When the case proves troublesome, as it will be liable to do when the blood is unusually profuse, deep-seated, or deprived of vitality, subcutaneous evacuation, followed by systematic compression, will be necessary.

Various other kinds of tumors, properly so called, are liable to form on the scalp. The most common are the *sebaceous*, which sometimes exist in considerable numbers, and which are always easily diagnosticated. The proper remedy is removal by incision and enucleation.

A *cystic* tumor, generally congenital, sometimes occurs on the head, either beneath the aponeurosis of the occipito-frontal muscle, or in the substance of the scalp. It is filled with serous fluid, fluctuates on pressure, and is seldom larger than a pigeon's egg or an almond. In some instances it is multilocular, or composed of a congeries of cysts, closely grouped together. The remedy is extirpation.

Fig. 67.



Fibrous tumor of the scalp.

The *fibrous* tumor is sometimes met with in this situation. Such a growth, removed by Professor Pancoast, at the Jefferson College Clinic, in 1858, by means of the écraseur, is represented in fig. 67. The patient was an elderly man; and the tumor, which occupied the vertex, and was of the volume of a large orange, had been of several years' standing. Its summit had been invaded by ulceration.

Different kinds of *vascular* tumors, arterial, venous, or arterio-venous, are liable to form on the scalp, and may in time acquire a large bulk and a very formidable character. Riddance should be effected as early as possible.

A congenital tumor, to which the term *craniomeningocele* may, I think, very properly be applied, is occasionally met with on the head, generally in the occipital region, but sometimes also in the parietal and frontal. It is usually situated at the middle line, and, as the name implies, is filled with cephalo-spinal fluid, protruded along with the membranes of the brain through a small opening in the skull, a fontanel or a suture. The tumor, orginally, perhaps, not larger than a pea or cherry, is capable of acquiring a considerable bulk, and is commonly of an elongated conical form with a rather narrow neck. It is free from pain and pulsation, fluctuates more or less distinctly, is in great degree divested of hair, and is rendered tense under mental emotion. When small, it may be almost completely effaced by pressure. It is essentially composed of the scalp and of the envelops of the brain. Its contents are perfectly limpid and uncoagulable.

Care should be taken not to confound such a tumor with hydrocephalocele and encephalocele. The chief points of distinction are, its small size, its conical form, its softness, its translucency, and its partial subsidence under pressure.

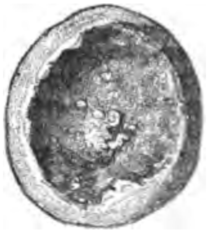
The prognosis is generally unfavorable. A cure may sometimes be effected when the cranial opening is very small; but under opposite circumstances relief will commonly be impracticable.

Two methods of *treatment* may be adopted, compression and ligation. The former may be conducted by means of a piece of sheet lead, confined by a bandage, the tumor having previously been reduced by puncture with a delicate needle. It should be steadily maintained for several months, and be aided by the occasional application of iodine.

Ligation is a dangerous operation, and yet it may be the only resource. The ligature should be firmly applied to the base of the tumor, so as to cause immediate strangulation.

In a case of this description, kindly drawn up by Dr. F. F. Maury in a child fourteen months old, subjected to this treatment at the Jefferson College Clinic in 1863, death occurred at the end of the sixth day from arachnitis. The tumor, which was of a conical shape, grew from the centre of the occiput, and was at birth about the volume of a small hazelnut. It remained nearly stationary until the tenth month, when it rapidly increased in size, and at the time of the operation it was an inch in length by half an inch in diameter.

Fig. 68.



Malignant ulcer of the scalp.

Malignant tumors of the scalp are infrequent. The most common form is the epithelial, or exedent lupus, which, usually beginning as a warty excrescence or small shot-like tubercle, in its progress occasionally involves the cranial bones. The resulting ulcer, fig. 68, is characteristic, having a foul, unhealthy aspect, and being the seat of a sanious, fetid discharge. The only remedy is early and free excision.

Surgical interference with tumors of the scalp should never be attempted without due preparation of the system, as it is extremely liable to be followed by erysipelas and other bad effects, jeoparding life.

SECT. II.—CONCUSSION OF THE BRAIN.

Concussion of the brain has been variously defined by different writers, hardly any two agreeing in regard to it. The most common idea appears to be that it is a commotion of the nervous fibres, or, more properly speaking, of the nervous tubes, inducing a change, vague and indefinable, in the relations which they sustain to each other and to their vessels. How far such a view is worthy of adoption it is not easy to determine; for it is very certain that, notwithstanding all that has been said upon the subject from the earliest periods of medicine down to the present, the progress of science has failed to afford us any substantial light respecting the true mechanism of this occurrence. The modern pathologist, in surveying this interesting and important topic, finds that he has no reason to pride himself upon his knowledge; if he attempts to penetrate beyond the trodden paths of his predecessors, doubts and difficulties meet him at every turn, and soon compel him to retrace his steps.

If we reflect upon the pulpy structure of the brain, it is surprising that any one should ever have seriously entertained the idea that, during concussion, this organ experiences a diminution of size, from the condensation of its constituents. Such an explanation is certainly not well calculated to afford us any very correct conceptions of the nature of this lesion. Accurately filling the cranial cavity, it is impossible that the brain could undergo any change of bulk from a mere commotion of its substance. A decrease of size can be effected only by the action of the absorbents, not suddenly, but gradually, in a manner altogether irreconcilable with the production of concussion. The theory of an increase of bulk of the organ is equally absurd, inasmuch as such an occurrence can only take place in consequence either of extravasation of blood or of inflammatory exudation. The only idea that I can form of the nature of the injury is that it is caused by the jarring of the nervous substance, eventuating, at least in severe cases, in a loss of its consistence, if not in its positive laceration. To show how plausible this view is, it is only necessary to inquire into the character of the exciting causes of concussion. In general, the accident is produced by direct violence, as a blow or fall upon the head. Now, when this happens, it is easy to perceive how the brain is influenced by the vibratory movements communicated to it by the osseous case which incloses it. The force of the injury, instead of being expended upon the skull, is transmitted to the cerebral substance, which it jars very much as a bow may be supposed to be jarred in discharging an arrow. When the blow is slight, the effect will be proportionately mild, the patient being, perhaps, merely stunned; but when the force is severe or concentrated, the result will be different, the substance of the brain being not only shaken, but, it may be, even lacerated, the lesion exhibiting itself in the form of a fissure, which is immediately filled with blood, from the rupture of the small vessels.

Similar effects occur when the concussion is occasioned by violence applied indirectly, as when a person, falling from a considerable height, alights upon his feet, knees, or buttocks. Here the force of the injury is transmitted along the bones of the extremities and of the spine to the base of the skull, where, exploding, it is communicated to the brain, very much in the same manner as when the head is struck with a hard body, as a bludgeon, poker, or brick. The effect of this form of concussion may be illustrated by what occurs in the boyish amusement of killing woodpeckers in countries abounding in cherries. To prevent the depredations of these marauders, a slender pole is sunk into the earth, its head protruding at the top of the tree. When the bird alights, the pole is struck with an axe, and the vibratory motion thus transmitted through the pole to his body kills him in an instant. Now, in this case, death is caused, not by any change of bulk in the brain, nor by any alteration in its consistence, but simply by the jarring of its substance, disqualifying it for the transmission of the vital fluid, and, consequently, also for the maintenance of its circulation.

Dissection unfortunately has thrown little, if any, positive light upon the nature of concussion. All that the knife has revealed in the examination of those who have perished from the immediate effects of the accident is of a negative character. The most minute inspection, both with and without glasses, has failed, in ordinary cases, to detect the slightest lesion of the cerebral tissues. Even in the worst forms, as those associated with compression, the most that has been found has been a laceration, commonly sufficiently insignificant, of some portion of the organ, attended, perhaps, with a trifling extravasation of blood. Sometimes, as when the rent has been more extensive, involving, it may be, the surface of the hemispheres, or the lateral ventricles, the effusion has been more considerable, but such an event constitutes the exception, not the rule.

As concussion of the brain may exist in various degrees, so the *symptoms* which characterize it may present various shades of difference, depending upon the severity of the injury; hence it will be proper to study these symptoms with reference to their diagnostic and therapeutic value. It will greatly facilitate the comprehension of the subject if we adopt the division of concussion into the three stages of collapse, reaction, and inflammation, usually recognized by writers and teachers; for, although such an arrangement is altogether arbitrary, and, therefore, unnatural, yet something of the kind is absolutely neçessary for the sake of clearness of description.

1. The stage of *collapse* is characterized by symptoms of exhaustion, not unlike those produced by the loss of blood. The system has received a shock, varying from the slightest functional disturbance to complete insensibility, life being suspended, as it were, merely by a feeble thread. In the former case there will probably be only slight pallor of the countenance, a confusion of ideas, a disposition to yawn, and a feeling of nausea. The patient rubs his eyes, stares wildly around, and perhaps vomits; but, presently recovering his consciousness, he gets up, and goes about his business as if little or nothing had occurred. This is an example of slight concussion, such as happens when a man is pitched gently off a horse, thrown out of his carriage, or struck upon the head. When the lesion exists in a more aggravated degree, these symptoms will not only be much more distinctly marked, but of longer duration, a number of hours, perhaps, elapsing before reaction will set in. The prostration is profound; the countenance is of a deadly pallor; the breathing is almost extinct; the pulse is soft, feeble, fluttering, and intermittent, sometimes hardly perceptible; the loss of strength is complete; deglutition is impossible; the stomach, oppressed with nausea, perhaps lazily ejects its contents; the bowels are relaxed, and there are occasionally involuntary discharges; the pupils are usually contracted, but still somewhat sensible to light, or one is diminished and the other dilated, or, finally, one is contracted and the other natural; special sensation is in a state of abeyance; the mind is prostrated; and the patient, roused with difficulty, answers, if spoken to, in a drawling monosyllable. The surface of the body soon becomes cold, and is

often bathed with perspiration. The condition of the bladder varies; in general the urine dribbles away involuntarily, but sometimes it is retained, and requires to be drawn off with the catheter.

The duration of this stage varies from a few minutes to several hours or even days, depending upon the extent and severity of the lesion. When the functional disturbance is slight, it may last only a very short time, otherwise the prostration will be more persistent, and sinking may occur, without any effort at reaction.

The symptoms of collapse from concussion are sometimes painfully simulated by those of intoxication, or it may be that the two affections coexist, thus increasing the embarrassment. The diagnosis is to be deduced from the history of the case, the presence of external injury, particularly upon the scalp, the habits of the patient, and the state of the breath, which, in inebriation, will be alcoholic in its character. When doubt exists, the proper plan is to treat the case as one of concussion, endeavoring, by the means presently to be mentioned, to bring on gradual reaction. A few hours will generally suffice to reveal the true nature of the affection, and this interval is not spent idly by the surgeon, but in a thorough examination of the body, with a view to the prompt detection and rectification of other injuries.

The leading indication in the stage of collapse is to establish reaction, or to rouse the enfeebled, and, perhaps, flagging energies of life. This object may usually be attained by very simple means, promptly and judiciously employed. The first thing to be done is to place the patient recumbent with his head on a level with the body, or, if the symptoms are at all urgent, even considerably lower, in order that the heart, exhausted by the shock, may be enabled to throw the blood with more facility to the exhausted brain. A free access of air is next procured, by opening the doors and windows of the apartment, and by the active use of the fan. If there are any bystanders, or idle spectators, they must immediately be sent away, as their presence cannot fail to be prejudicial to the patient. Any tight garments, especially the collar and pantaloons, must promptly be relaxed, to give full play to the respiratory muscles. Cold water is freely dashed upon the face and chest, smelling bottles are held near the nose, not steadily, but intermittently, and sinapisms are applied to the extremities and to the precordial region. In the milder forms of concussion, these means are generally amply sufficient for the speedy establishment of reaction; but when the case is very severe it may be necessary, in addition, to place sinapisms along the whole length of the spine, and to employ stimulating injections, as water impregnated with mustard, common salt, brandy, or spirits of hartshorn. If the feet are cold, they may be immersed in warm water, or rubbed with hot cloths, and afterwards wrapped up in warm flannel. As soon as the patient is able to swallow, he may take a little cold water, or water and spirits, the latter being more especially indicated when the system is long in showing signs of reaction. Spontaneous vomiting sometimes greatly promotes restoration, particularly if a hearty meal was taken shortly before the occurrence of the accident; a heavy load being thus removed, the diaphragm enjoys greater play, the pneumogastric nerves act with increased vigor, and the heart propels the blood with greater force to the paralyzed brain.

As life returns, color succeeds pallor, warmth coldness, and intelligence confusion of ideas; the pulse resumes its wonted force and activity, the respiration becomes more natural, the stomach is relieved of nausea, the sphincters recover their proper functions, the special senses are again on the alert, and volition is exercised with its proper freedom. The restoration may be rapid or gradual, temporary or permanent; once fully established, however, it rarely recedes, but, on the contrary, steadily advances, with a tendency, not infrequently, to over-action.

In treating concussion of the brain, the young practitioner is apt to be led into several serious errors, especially if he is surrounded by officious bystanders, and not perfectly self-possessed.

1st. He may be foolish enough to draw blood, or, at all events, to attempt to draw blood while his patient is in a state of profound exhaustion, unable, perhaps, to crook a finger or utter a syllable. Nothing is more common immediately after such accidents than for the friends of the patient to insist vociferously upon his being bled; and if the practitioner, in an unguarded moment, yields to the silly request, he may destroy life on the instant, or render the reaction a matter of great difficulty, if not of impossibility. To bleed a man in such a condition would be as absurd and culpable as to bleed him when he is in a state of syncope from the loss of blood.

2d. Great care should be taken in the use of ammonia, and other pungent articles, not to hold them too near the nose, lest they induce spasm of the glottis, and thus suffocate the patient. Moreover, their employment may give rise to inflammation of the nares, fauces, larynx, and trachea.

3d. The practice of pouring drinks into the patient's mouth, before he is able to swallow, cannot be too pointedly condemned. It is fraught with great danger, on account of the liability of the fluid to pass into the windpipe, where even a small quantity might induce suffocation. The patient should, therefore, be sufficiently conscious to know what is being done to him, or, if he cannot be properly roused, and the symptoms are very urgent, the fluid should be placed in contact with the fauces, beyond the reach of the larynx, the act of deglutition being thus excited without any risk of injury.

4th. When stimulants are used, due regard must be had to their quality and quantity, as well as to the period of their administration. Brandy, as a general rule, is preferable to anything else, but it should be given sparingly, and its use be suspended the moment reaction has fairly commenced. The object is to rouse the system gradually, not rapidly, to coax, not to force, the jaded powers of life; this wish attained, all artificial excitants are refrained from. In ordinary cases no internal stimulants are required.

5th. The accident may have occurred soon after a hearty meal, and then the question may arise in regard to the propriety of exhibiting an emetic. Nature sometimes decides this for the practitioner, by the institution of spontaneous vomiting; but when this does not happen, and there is no contra-indication, as there will be when the concussion is complicated with compression, it may be excited by salt and mustard, ipecacuanha, alum, or zinc, aided by large draughts of tepid water. During the act of emesis, whether occurring spontaneously, or induced artificially, the patient should lie with his head inclined forwards, otherwise some of the ingesta, as they are lazily ejected, may drop into the air-passages, and so cause fatal asphyxia.

2. *Reaction* being established, the surgeon's duty plainly is, not to fold his arms idly, on the one hand, nor to be over-officious on the other. His business is to stand as a guard over his patient, carefully watching, and measuring, as it were, every symptom as it arises, in order, if possible, to form a just appreciation of its pathological import, and to seize the earliest moment to counteract any aberration from the healthy action. The great danger now is from inflammation of the brain. Usually, after the patient has completely regained his faculties, it is observed that the functions which were suspended are performed with a slight degree of excitement; but this is not to be taken as an evidence for active interference; on the contrary, it generally disappears spontaneously in a few hours, the surface becoming moist, and the pulse losing its sharpness and frequency. The diet is light and non-stimulant, perfect quietude of mind and body is enjoined, and the bowels are moved by gentle laxatives. If the shock has been at all severe, the patient is warned against premature exposure, even if the symptoms have happily passed off; he must consider himself as an invalid for weeks, and avoid everything calculated to awaken excitement in the recently shattered organ, now peculiarly prone to take on morbid action from the slightest causes. The head must be sedulously watched, and any pain of which it may be the seat, must be looked upon with suspicion, especially if it be combined with irritable temper, vitiated appetite, and a sharp, frequent pulse. A brisk purgative, and a few leeches to the temple, or the abstraction of a little blood from the arm, may avert the threatened evil, and prevent it from passing

the natural limits, while the delay, even of a day, may enable it to reach a crisis which may speedily prove destructive to life.

3. *Over-action* of the system, consequent upon the cerebral lesion, constitutes the third stage of concussion. The period of its access is variable. In general, it comes on within the first four or five days, sometimes, indeed, within the first twenty-four hours; but instances not infrequently occur in which it does not manifest itself for weeks and months, the patient considering himself all the while out of danger, and fully competent to attend to his daily occupation. In the former case, the disease is usually bold and undisguised; in the latter, it is often latent, its approaches being slow and stealthy, and its progress, consequently, often considerable before its true nature is discovered. Such examples are always peculiarly dangerous, on account of their liability to be overlooked and mistreated.

Traumatic inflammation of the brain, as it ordinarily exhibits itself, is characterized by high febrile disturbance, intolerance of light and noise, cephalalgia, flushed countenance, suffusion of the eyes, vigilance, excessive thirst and restlessness, heat and dryness of the skin, hurried respiration, coated tongue, loss of appetite, constipation of the bowels, scanty and high-colored urine, and a quick, hard, and frequent pulse. The mind begins to wander at an early period, and gradually muttering delirium, or maniacal excitement, sets in. The carotid arteries often beat with great force. As the disease advances, the patient is seized with spasm, and finally with coma, paralysis, and convulsions, which soon close the scene, life usually terminating in from three to six days. On dissection, the brain and its envelops are observed to be in a state of disease, portions of the former being softened, and seemingly mixed with blood and pus, and patches of the latter preternaturally vascular and incrusted with lymph. Serum, often in considerable quantity, exists in the ventricles, at the base of the skull, and on the top of the hemispheres. The dura mater is usually free from disease, but the pia mater and arachnoid are almost always involved, as is evinced by the injected condition of the vessels of the former, and the opaque appearance of the substance of the latter. Sometimes the principal evidence of the morbid action exists in the subarachnoid cellular tissue, in the form of lymph and pus.

In the *treatment* of this variety of inflammation, the object is to assail the morbid action as early and as vigorously as possible. It will readily be understood that, in an organ so essential to life as this is, there can be no hope of relief if the disease is permitted to obtain the slightest ascendency. Few cases recover when structural lesion has taken place, or when there are inflammatory exudations. Hence, whatever is done must be done promptly and energetically. The treatment, too, is sufficiently simple. Blood is taken liberally from the arm and temples; the bowels are thoroughly evacuated with calomel and jalap, aided, if need be, by enemas; the head, shaved and elevated, is enveloped in a bladder partially filled with ice; light and noise are excluded from the apartment; and the patient is kept upon the smallest possible allowance of food, of the most bland and simple character. Cold water, simple or acidulated, constitutes the proper drink. After the first heat of the conflict is over, the same means are continued, but in a milder form, the antimonial and saline mixture with occasional leeching now taking the place of the lancet. Sleeplessness and jactitation are relieved by the cautious use of anodynes, combined, if there is dryness of the surface, with antimony. Counter-irritation is sometimes beneficial, but generally much less than has been supposed. Indeed, my experience does not enable me to say anything in its favor. Pustulation with croton oil rubbed behind the ears is, perhaps, the least objectionable mode; it is certainly less painful than vesication of the nape of the neck, and is, I think, quite as efficacious. Occasionally, especially when there is much delirium, a blister may advantageously be applied to the inner surface of the thigh. When effusion is threatened, or is already going on, mercury, in the form of calomel, or the protiodide, properly guarded with opium, and given in full doses, as three grains of the former, or one of the latter, every four hours, is indicated, and should be rapidly pushed to the extent of decided ptyalism. After the influence of the remedy has been fully established,

This book is the p
COOPER MEDICAL

iodide of potassium may be used as a substitute, to complete the cure, should nature and art be fortunate enough to accomplish it.

The more insidious form of inflammation of the brain, consequent upon concussion, is by no means uncommon, and is particularly dangerous, for the reason, as was previously mentioned, that it is so very liable to be overlooked at a period when treatment can be of any avail. The patient has, perhaps, made a very rapid recovery, and is therefore disposed to resume his accustomed business, hardly thinking that anything has ailed him. This is particularly apt to happen when the injury has been very slight, and the effect very transient. Under such circumstances, it may be quite impossible, with all the arguments that the practitioner can adduce, to persuade him to refrain from exercise and food even for a few days. He will not consider himself an invalid. He goes about his business, eats, drinks, and is merry. By and by, he begins to feel unwell; his head aches, his temper is easily ruffled, his appetite is capricious, his bowels do not act properly, his sleep is interrupted by unpleasant dreams, he has occasional fits of dizziness or vertigo, his pulse is too frequent, and he cannot apply himself with any satisfaction to his pursuits. Such is the usual prodrome of an event which has cost many a man his life. Mischief is stealthily going on in the brain, or in the brain and its membranes, which, if not promptly checked, will soon burst forth like the smothered flame of the incendiary's fire. In a little time the system is overwhelmed with excitement; soon delirium follows; then come coma and paralysis, and finally convulsions seal the sufferer's doom. Inspection reveals serious lesion of the brain and its envelops, with effusion of lymph and sero-purulent matter on the surface of the latter, and softening and perhaps abscess in the substance of the former.

The nature of this form of disease is, unfortunately, seldom recognized by the practitioner in time to afford his patient the necessary relief. He is generally disposed to make light of it, or it may be that he overlooks it altogether. When at length his suspicions are aroused, he finds to his horror that the case is utterly beyond the reach of his skill. Effusion has taken place, and death is inevitable.

The treatment of this secondary affection does not differ materially from that of the primary. As soon as it begins to show itself, the patient must be restricted to the most scrupulous antiphlogistic regimen, and submit to active and steady purgation, with the liberal use of tartrate of antimony and potassa. If head-symptoms exist, blood is taken from the arm and temple, and counter-irritation is applied to the nape of the neck by seton, issue, or blister, its action being much more advantageous here than in the acute form of the malady. The treatment is continued for some time after all disease has apparently vanished, the patient slowly returning to his former habits and occupation.

Other effects, some primary and some secondary, are liable to follow concussion of the brain. Among these, the most prominent are a sallow, icterode, and haggard state of the countenance, disturbed sleep and frightful dreams, pain in the head, dizziness, vertigo, loss of memory, partial deafness, impaired vision, contracted or dilated pupil, strabismus, difficulty of articulation, muscular twitchings, partial paralysis, nausea and vomiting, constipation of the bowels, irritability of the bladder, and gradual emaciation.

Preternatural slowness of the pulse is sometimes observed; it is most common in injuries of the base of the brain, especially of the medulla oblongata, the varolian bridge, and the cerebral crura, and may not completely disappear under several months. A remarkable feature in this condition of the pulse is the readiness with which, when the patient is excited, it is changed into quickness.

The loss of memory is among the most singular of these occurrences. It often exists in a remarkable degree, and may take place by itself or in association with other affections. Generally, it refers only to recent events, but in some instances it involves every circumstance in the history of the individual's life, past and present. Sometimes he will talk with all the garrulity of old age of the occurrences of his childhood, miscall objects, or be unable to connect his words, or to pronounce certain letters. I have seen three cases in which the patient could not recollect his own name, the country of his nativity, or his present residence. Occasionally the mind is in a state bordering upon fatuity, or mental alienation. Epilepsy is another, though, happily, an uncommon occurrence. Cases are met with in which the sexual powers are seriously impaired; sometimes temporarily, sometimes permanently. Such an effect is particularly apt to follow those cases in which the injury has been inflicted upon the back of the skull. Another occasional consequence of concussion of the brain is saccharine diabetes. An albuminous condition of the urine, with or without diminution of urea, is occasionally noticed.

What the pathology of these affections is is not known, as dissection has thus far failed to throw any light upon it. It may be supposed, in the absence of positive facts, that they are dependent upon local congestion, irritation, or inflammation of particular parts of the brain, or of the brain and its envelops, upon laceration of the cerebral substance, upon the presence of extravasated blood, serum, or lymph, or upon injury of the cerebral nerves.

The *treatment* must, of course, be in great measure empirical; but, however this may be, it should always be particularly directed to the head and alimentary canal, consisting mainly of local depletion, quietude of mind and body, the administration of purgatives, an occasional emetic, counter-irritation, especially of the pyogenic kind, and a careful regulation of the diet. A gentle course of mercury is sometimes beneficial, and in most cases signal advantage will accrue from change of air, tonics, and the cold shower-bath, with dry friction.

In the management of traumatic inflammation of the brain and of its envelops, both primary and secondary, special inquiry should be made, from time to time, into the condition of the more important viscera, particularly of the kidneys, as any serious intercurrent lesion on their part may occasion symptoms closely simulating those produced by injury of the head, and thus lead to essential modifications in the diagnosis and treatment of the case.

SECT. III.—COMPRESSION OF THE BRAIN.

It is hardly possible to give a more satisfactory definition of compression of the brain than of concussion. Every surgeon knows what import to attach to the expression, but to say what compression is, or how it is produced, are questions that have puzzled and perplexed many of the wisest men in the profession. The legitimate meaning of the term, and as it is generally understood, is that the cerebral substance is pressed, by some eccentric force, into an unnatural space, or, in other words, that the normal volume of the part pressed upon is diminished. But is this really the case? Is it possible to compress an organ composed of so pulpy a structure as the brain? I cannot myself conceive of such an occurrence, unless we take a portion of brain and subject it to an amount of artificial pressure such as is altogether inconsistent with what takes place even in the worst cases of compression within the skull. We can conceive how the different portions of the brain may be changed in their relations; how one part may be flattened and another part expanded in consequence; how, for instance, the convolutions of the hemispheres may be pressed out, and how their furrows may be effaced; how the lateral ventricles may be encroached upon, and even obliterated; how the vessels of the brain may be flattened and destroyed; but we cannot, I repeat it, conceive how the cerebral tissues can be so condensed and squeezed together as to occupy less space than in the natural state. This view of the case, it seems to me, is the only one that is at all admissible, and therefore, if we assume it to be correct, it follows that compression of the brain is merely a change of the relative position of the component portions of the organ, and not what the term really signifies in its etymological sense. Dissection affords daily proof of the correctness of this opinion. We sometimes see the greater part of a whole hemisphere flattened by an enormous coagulum, and yet, if the affected portion could be accurately measured, it would be found to occupy as much space as in the normal state, or as it did previously to the accident. The change is observed to depend mainly, if not exclusively, upon the depression of the convolutions and the effacement of the intervening spaces, and not upon any condensation of the cerebral tissues, or any actual reduction of their volume. The pressure exerted by the clot could not act in any other manner, because its force is not sufficient; nor is it possible for a piece of bone to cause any more efficient pressure, for the moment the force thus applied exceeds the force of the resistance, the brain gives way, and projects up beyond the edges of the depressed bone.

Compression of the brain may arise from various *causes*, but, surgically considered, they may all be referred to four classes: extravasated blood, depressed bone, effused pus, and foreign bodies.

However induced, the *symptoms* of compression are always of the same character, and are generally easily recognized, as every organ of the body is affected by the cerebral disorder. The period of their appearance is influenced by the nature of the exciting cause. When the compression is dependent upon depression of bone, the symptoms are usually immediate, whereas in compression from extravasation of blood some little time often elapses, especially when there is great shock. In compression from effusion of matter, a number of days intervene between the occurrence of the injury and the appearance of the symptoms, the parts being obliged to pass through the several stages of inflammation before they can reach the suppurative crisis.

A person laboring under compression of the brain is deprived of sensibility and motion; he is unconscious of what is passing on around him; if he is spoken to, he makes no reply, not even in a monosyllable; he cannot hear, nor see, nor taste, nor smell, nor has he any power to articulate, to swallow, or to protrude his tongue. The countenance is ghastly pale and devoid of expression; the eyes are turned up, glassy, and fixed; the lids are closed; the pupils are widely dilated, and insensible to light; the breathing is slow, labored, stertorous, and performed with a peculiar whiffing or blowing sound; there is hemiplegia, or paralysis of the side opposite to the seat of injury, and, as a necessary consequence, the corner of the mouth is drawn over towards the sound side; the pulse is slow and oppressed; the stomach and bowels are torpid; and the bladder is incapable of expelling its contents.

These symptoms do not always exist in the same degree, nor are they all equally well marked in every case. The compressing cause being slight, the phenomena will be proportionately mild. Thus, the patient may be only partially insensible; his intelligence may be weakened, but not abolished; the special senses may still be able to perform their functions, although very imperfectly; the paralysis may be confined to one limb, or to certain muscles; the pupils, pulse, and respiration may only be slightly altered; the bowels may be torpid, but only in a moderate degree, and the bladder may still be able to expel a portion of its contents. If the foot is pinched the patient will moan, or draw the limb away, thus showing that he has still some feeling, if not motor power.

The paralysis which attends this affection is usually on the side opposite to that of the compressing agent, the occurrence being generally supposed to depend upon the decussation of the fibres at the base of the brain. This is doubtless true, but whether it is or not, the fact is of great practical importance in relation to the operations that may be required for the patient's relief. In a few instances, as inexplicable as they are rare, the paralysis exists on the same side as the cause of compression.

The state of the pupils is very variable. In general, they are widely dilated, but occasionally they are contracted, and cases occur in which one is contracted and the other dilated. A diminution of both pupils is extremely uncommon.

The stertor in this affection is caused by paralysis of the palate, which, hanging like a loose curtain in the throat, flaps to and fro as the air passes in and out of the lungs during respiration. The blowing, whiffing sound, and the distension of the cheeks are due to the loss of tone in the buccinator and labial muscles.

DIFFERENTIAL DIAGNOSIS OF CONCUSSION AND COMPRESSION.

If compression of the brain were always an uncomplicated affection, it would be difficult, if not impossible, to confound it with other diseases; but such, unfortunately, is not the case. Not infrequently it is blended with concussion, the symptoms of the two lesions being so commingled as to render it doubtful to which they properly belong. As such an occurrence is always exceedingly embarrassing, and must, to a greater or less extent, influence the nature of the treatment, it is the duty of the surgeon to study the features of each complaint, in its more simple forms, so that, when he meets with them in combination, he may be the better able to discern their various shades of difference. The subjoined summary of the diagnostic characters of the two affections will serve to aid him in his investigations.

Concussion.	Compression.
1. The symptoms are immediate, coming on instantly after the infliction of the injury.	1. An interval of a few minutes, or even of a quarter of an hour, sometimes elapses, especially if the compression is caused by extravasation of blood.
2. The patient is able to answer questions, although with difficulty, and usually only in monosyllables, as yes or no.	2. The power of speech is totally abolished; we may halloo in the patient's ear as loudly as possible, and yet there will be no response.
3. Special sensation is still going on, the patient being able to hear, see, smell, taste, and feel.	3. Special sensation is destroyed.
4. The respiration is feeble, imperfect, and noiseless.	4. The respiration is slow, labored, stertorous, and performed with a peculiar blowing sound.
5. The pulse is weak, tremulous, intermittent, and preternaturally frequent.	5. The pulse is labored, soft, irregular, and unnaturally slow, often beating not more than fifty, fifty-five, or sixty strokes in a minute.
6. There is nausea, and sometimes vomiting.	6. The stomach is quiet, and insensible to ordinary impressions, even to emetics.
7. The bowels are relaxed, and there are sometimes involuntary evacuations.	7. The bowels are torpid, and are with difficulty excited by the action of purgatives.
8. The power of deglutition is impaired, but not abolished.	8. Deglutition is impossible, and sometimes does not return for several days.
9. The bladder retains the power of expelling its contents; but sometimes, owing to the weakness of its sphincter, the water flows off involuntarily.	9. The bladder is paralyzed, and, therefore, incapable of relieving itself, the surgeon being obliged to use the catheter.
10. The voluntary muscles, although much weakened, are still able to contract, there being no paralysis.	10. There is always paralysis on one side of the body, generally opposite to that of the compressing cause.
11. The pupils are usually contracted, and somewhat sensible to light; the lids are open and movable.	11. The pupils are widely dilated, and unaffected by light, the lids being closed and immovable.
12. In concussion, the mind is in a state of abeyance; it is weak and confused, not abolished.	12. In compression, the mind is absent, and the patient is comatose.

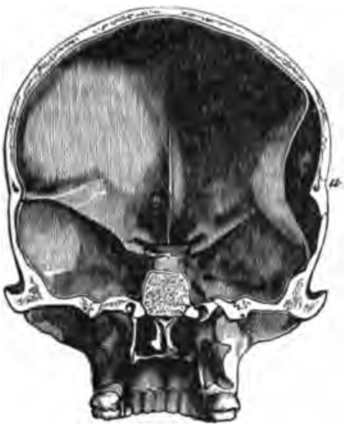
Treatment.—The treatment of compression of the brain must be regulated by the nature of the exciting cause, which it will, therefore, be necessary next to consider.

a. COMPRESSION FROM EXTRAVASATION OF BLOOD.

This species of compression is of frequent occurrence, and may exist either with or without fracture of the skull. It is invariably the result of external violence, acting directly or indirectly upon the vessels of the brain and its envelops. The extravasated blood may be situated at five different points: first, between the dura mater and skull; secondly, in the arachnoid sac, on the surface of the brain; thirdly, beneath the arachnoid membrane, in the furrows of the hemispheres; fourthly, in the substance of the brain; and, lastly, in the lateral ventricles. The first of these sites, fig. 69, is the most frequent, and, practically speaking, the most important, as it is the only one admitting of surgical interference.

The quantity of blood poured out here is sometimes very great, especially when it depends upon rupture of the middle meningeal artery. I have seen as many as eight ounces extravasated from this cause; in general, however, the quantity is much less, not exceeding, perhaps, one-half that amount. When the effusion is considerable, the blood usually presents itself as an irregular, dark-colored mass, lying in a sac formed by the dura mater and the inner surface of the cranium, the ruptured vessel, it may be, opening directly into it. Large quantities of blood are sometimes observed at the base of the skull and upon the antero-lateral aspect of the cerebral hemispheres, forming broad cake-like clots, from three to six lines in thickness. Copious effusions may also occur in the ventricles; but in the substance and on the surface of the brain they are commonly quite small, though, from the pressure which they exert upon the nervous pulp, they are hardly less dangerous to the cerebral functions.

Fig. 69.



Extravasation of blood between the skull and dura matter, from rupture of the middle meningeal artery *a*.

Having already spoken, in general terms, of the symptoms of compression, it only remains, in connection with this subject, that I should make some remarks on the *diagnosis* between this form of compression and that produced by the depression of bone, and on the distinction between it and apoplexy.

In compression from extravasated blood, the symptoms, although sometimes immediate, do not generally appear for some little time, the interval being occupied by a state of concussion, during which the lacerated vessels, in consequence of the exhausted condition of the heart, pour out hardly any blood; but as soon as reaction begins, the bleeding recommences, and now proceeds with great vigor, the fluid running into, and filling up, every accessible space. It is now, perhaps before the patient has recovered any consciousness, that compression, for the first time, shows itself, as is evinced by the comatose state of the brain, the stertorous breathing, the slow and laboring pulse, the hemiplegia, or general paralysis, and the dilated and insensible pupil. Occasionally the extravasation results, apparently, from very trifling causes. A man, for example, receives what he conceives to be a slight blow upon the head. He is somewhat stunned; but, soon recovering his consciousness, he gets up, and resumes his work. In a short time, often not exceeding ten, fifteen, or twenty minutes, he is observed to turn deadly pale, to reel, and finally to fall down in a fit, foaming at the mouth, and appearing as if partially asphyxiated. Such an accident is particularly liable to happen when a large artery has been wounded, as, for example, the middle meningeal; the orifice of the vessel, partially closed during the exhausted state of the system consequent upon the injury, now that reaction has ensued, has become reopened, and lets out its contents in a full and rapid stream, suddenly overwhelming the brain and heart, and literally reducing the sufferer to the condition of a mere automaton.

There is occasionally what may be called secondary extravasation of blood, inducing compression at a more remote period than in the form of the lesion just described. Cases of this kind are, in fact, not uncommon, and, as they are always remarkably insidious in their character, they are extremely liable to be overlooked. They are most apt to follow injuries of the skull and brain attended with concussion. After the symptoms of shock have passed off, the pulse either remains unnaturally slow, or if, as often happens, it becomes too frequent, it soon sinks again below the normal standard, beating, perhaps, only fifty, fifty-five, or at most sixty-five, in the minute, at the same time that it is full and laboring. The mind is sluggish and fretful, the pupil is torpid and rather dilated, the counenance is more or less flushed, and the patient complains of headache, with ringing noises in the ear. If let alone, he gradually sinks into a comatose condition, followed by squinting and convulsions, and finally dies under symptoms denotive of cerebritis and hemorrhagic effusion. The blood often exists in large quantity, and in various degrees of consistence, much of it being quite soft and of a dark color, thus showing that it was poured out only a short time before death, in consequence, apparently, of the softened and lacerated condition of the cerebral tissues at the site of injury, and the inability of the vessels to protect themselves by the formation of firm clots.

In compression from *depression of bone*, the symptoms are immediate. The only exception to this rule is in slight depression, incapable, of itself, of producing compression, but, where this occurrence ensues from injury done to the soft parts, eventuating in effusion of blood, the two causes thus co-operating in bringing about the result. Moreover, extravasation may take place without fracture, or with fracture unattended with depression.

Compression of the brain from extravasation of blood may be mistaken for *apoplexy*. Such an error may readily occur, simply from a want of proper knowledge of the history of the case. Thus, a man may be found in the street, in a state of insensibility, with all the ordinary symptoms of compression; no one knows anything of the nature of his affection, and the most thorough examination of the body fails to throw any light upon it. There may not even be a scratch upon the scalp. The man dies, and inspection reveals the existence of a fracture with a large extravasation of blood. The symptoms of the two affections are, in fact, forcibly alike, and the error is really, practically, of no consequence, unless, in the case of compression from external violence, the effusion should happen to be accessible to the trephine.

The symptoms of compression are sometimes perplexingly simulated by *intoxication*, and the embarrassment will be materially increased if the accident is accompanied by signs of injury of the scalp. In such an event the history of the case, the presence or absence of alcoholic odor of the breath, and the habits of the patient will be the most reliable guides to a correct appreciation of the nature of the affection. If the case is one of pure inebriation, the effects will probably pass off in a few hours, whereas, if it is one of compression from extravasated blood, they will be permanent.

The *treatment* of this affection will depend upon the site of the effused blood, and the absence or presence of fracture of the skull. When the blood is accessible, it is obvious enough that it should be evacuated; but how is the practitioner to know this? How can he determine whether it is situated immediately beneath the cranial bones, upon the hemispheres of the brain, at the base of the skull, in the cerebral substance, or within the ventricles? Are there any symptoms, any grand landmarks which will serve to point out the spot where the compressing agent is lodged? The most subtle pathologist and diagnostician must be at fault here. Especially must this be true when there is no fracture, or outward evidence of injury. Indeed, even when there is a fracture, we cannot always be certain. To illustrate: A person has compression, and the symptoms render it pretty clear that it has been caused by extravasation of blood; there is no visible fracture, but a contusion on the scalp denotes where the injury was inflicted, and hemiplegia exists on the opposite side. Taking these facts in connection, the presumption is that the effusion is on the side of the brain where the head has been hurt, and, acting upon this view, the surgeon, especially if he is fond of operating, may feel inclined to perforate the bone. But is he right in doing so? He may, if he embark upon the enterprise, find the object of his search; but he is groping in the dark, and there is quite as much likelihood that he will fail. The blood may be far beyond his reach, and thus the patient may have been subjected to a fruitless and dangerous operation. Besides, it must not be forgotten that the blood may be at a point opposite to that upon which the blow has been inflicted. A surgeon makes occasionally a fortunate hit. Dr. Physick, in a case of this kind, boldly perforated the skull at the site of injury, and, extracting the clotted blood, cured his patient. But how often has the operation failed? Where one surgeon has succeeded, twenty have been disappointed. A judicious practitioner should have something more than conjecture to guide him in such an undertaking.

The truth is, the only case in which such a procedure is really warrantable is where the extravasation is associated with, or dependent upon, fracture of the skull, complicated with depression, or serious injury of the soft parts, or where the fracture is situated directly over the course of the middle meningeal artery. But even here the operation does not always succeed, as I know from personal observation. A boy, ten years old, was thrown off a heavy log, which, rolling over him, broke his skull directly over the right temple. The fracture, although not compound, was comminuted, and, as the symptoms were urgent, I made an incision through the scalp, raised a loose and slightly depressed piece of bone, and extracted a large coagulum. No relief followed; for, as fast as the blood was removed, the osteo-matral cavity, which was quite capacious, filled up again, and I was finally compelled to close the wound, as best I could, with a compress and a tight roller. If this had not been done, the boy would certainly have speedily bled to death. As it was, he died unrelieved in less than forty-eight hours.

Cases are occasionally met with where, after the skull has been perforated, the blood is observed to be seated in the arachnoid sac, beneath the dura mater, lifting up this membrane in the form of a small, bluish swelling, beating synchronously with the left ventricle of the heart. Under such circumstances, the proper operation, it has been alleged, is to make an opening into the tumor, and let out its contents. But such a procedure must, it is obvious, seriously complicate the case, exposing the patient to the occurrence of inflammation and fungous protrusion, to leave out of the question the possibility, even in a minority of cases, of removing the clotted blood, or, after this has been effected, of preventing a new hemorrhage, perhaps quite as copious as the original. My opinion is that little advantage is to be gained from such an undertaking, and that it would be well, in view of its hazards, to refrain from it altogether.

Since, then, so little is to be accomplished by operation, how is the treatment of this affection to be conducted? Obviously, upon the same general principles as that of ordinary apoplexy, from which, as has already been seen, compression from traumatic extravasation differs only in the absence of external injury, as, for example, laceration of the scalp and fracture of the cranial bones. The object is twofold: first, to enable the brain to accommodate itself to the effused blood, and, secondly, to promote the speedy absorption of this fluid. The first indication is fulfilled, after reaction has taken place, by copious general and local depletion, by the frequent use of active and rather drastic purgatives, and by the administration of the saline and antimonial mixture, along with the use of light diet, cold applications to the head, and perfect quietude of mind and body. By these means, properly employed, the quantity of the blood is materially reduced both in the brain and in the general system, and, while the danger of inflammation is lessened, the organ is gradually brought to bear with the extraneous substance, no longer resenting its presence. Blood must not, however, be taken heedlessly or causelessly. No surgeon, in his senses, would think of bleeding a patient before reaction has been established. But it is unnecessary to repeat here what has already been set forth, in regard to this subject, in speaking of concussion of the brain. The same rules must govern us here, in the use of the lancet, as in exhaustion of the system from other causes. Premature bleeding, in this form of compression and in apoplexy, has slain its thousands of subjects, or compelled the poor and crippled patient to drag out a miserable state of existence.

Mercury should be freely used at an early stage of the disease, as soon, indeed, as possible after thorough evacuation by the lancet and purgatives. It should be given in the form of calomel, in doses of three grains every six or eight hours, its action being assisted by inunction of the groins and inside of the thighs and arms with blue ointment. The gums must not merely be touched, but they must be maintained in a tender condition for a number of weeks. When the case has become chronic, iodide of potassium takes the place of the mercurial, as there is now less need of hurry.

Throughout the treatment, the greatest vigilance is exercised over the suffering organ, lest, in resenting the encroachment of the coagulum, it should take on inflammation, the slightest approach to which must instantly be met by the resumption of antiphlogistic measures.

Infants occasionally suffer from compression of the brain, from an effusion of blood beneath the dura mater, before the completion of the ossific process, caused by blows upon the head. The little patient lies in a state of insensibility, and is usually affected with convulsions or spasmodic twitches, and, perhaps, some degree of stertor. Considerable contusion of the scalp generally exists, but there is no fracture of the skull, because the bones are too yielding for such an occurrence, and the fontanel appears to be elevated somewhat above its proper level. Pressure made with the finger discovers unusual tension, and may aggravate the symptoms, especially the disposition to convulsions. Such a case is to be treated on general principles; with leeches and cold applications to the head, and stimulating injections, followed by a brisk purgative as soon as the power of deglutition returns. If these means fail, and the symptoms are very menacing, the duty of the surgeon plainly is to make a crucial incision through the scalp, and dissecting up the angles of the flap, to puncture the distended, and, perhaps, purple-looking membrane with the bistoury, taking care to make the aperture as small as may be consistent with the state of the extravasated blood, and to protect the parts, immediately after the evacuation has been effected, with adhesive strips, a compress, and a roller.

b. COMPRESSION FROM THE DEPRESSION OF BONE.

Depression of bone may exist to a considerable extent without compression; but when it gives rise to this state, the symptoms come on immediately, and continue until the brain has either accommodated itself to its new relations, until the offending portion of bone has been removed, or until the patient dies from the effects of the injury. The lesion may be one purely of compression from the depression of bone, or the accident may, as was previously intimated, be combined with extravasation of blood, caused by laceration of the cerebral or meningeal vessels, either by the depressed bone or by the vulnerating body. In the latter case, the compression may be very violent, although the depression itself may be slight. The symptoms, in this case, too, may, in the first instance, be imperfectly marked, those of concussion perhaps predominating over those of compression, but being speedily succeeded by the latter.

In the *treatment* of this form of compression, which will again come up for discussion in the remarks on fractures of the skull, no very definite rules can be laid down for the guidance of the surgeon. Every case must, so to speak, make its own rules. Practitioners are generally agreed that, when the compression is produced by depression of bone, attended with compound fracture, immediate recourse should be had to trephining, and such a procedure is certainly, it seems to me, the only one that ought to be thought of under the circumstances. In this way we not only remove the cause of compression, but place the parts in a much more favorable condition for speedy reparation. The question is still an open one as it respects the treatment of compression from depression, attended with simple fracture. I am fully sensible of the difficulties of the subject, surrounded as it is by doubt and contradiction; but, after the best consideration that I can bestow upon it, I am disposed to regard operative interference as justifiable only in the event of extensive depression, and I should adopt this plan whether the symptoms of compression were urgent or not, on the ground that the patient would be much less likely to suffer from subsequent cerebral disorder. When the depression is comparatively slight, and especially when there is no comminution of the bone, or great irregularity of its edges, giving them a rough, spiculated character, it would be well to let the bone alone, and to treat the case upon general principles, hoping thereby to prevent inflammatory mischief, and ultimate nervous irritation, which are so much to be dreaded in the more severe forms of the accident. There is a species of compression of the brain in children caused by extensive depression of bone without fracture, of which I have witnessed several remarkable examples, and which never requires operative interference. The bone is simply bent or indented, and usually, by its own resiliency, regains its natural level in a few days under the use of a little purgative medicine, light diet, and cold applications to the head.

c. COMPRESSION FROM THE PRESENCE OF FOREIGN BODIES.

Compression of the brain by a foreign body is an unusual occurrence, and could hardly take place without some concomitant depression of the skull. A large ball, a piece of iron, or a splinter of wood lodging in the cranial cavity, in the cerebral substance, or in the ventricles, might produce the effect, accompanied, probably, by a pretty copious hemorrhage, thereby seriously complicating the lesion. The symptoms would be likely to be immediate, as in compression from depression of bone, and the treatment would manifestly resolve itself simply into the extraction of the extraneous body, care being taken, in doing this, to inflict as little injury as possible upon the surrounding structures, and to guard the brain and its membranes afterwards against inflammation. Such lesions must necessarily be fraught with danger, and will rarely be recovered from, however judiciously managed.

d. COMPRESSION FROM EFFUSION OF PUS.

Compression of the brain from effusion of pus can occur only as a secondary effect, coming on at a period varying, on an average, from a week to a fortnight from the commencement of the inflammation which precedes its development. Every practitioner, however, meets with cases where the interval is much longer, and to which we may, therefore, apply the term chronic. In general the characteristic symptoms set in gradually, the disease bearing a great resemblance, in this respect, to the compression of the brain which follows arachnitis. There can, therefore, be no difficulty in discriminating between it and the other forms of compression already described, where the symptoms appear either immediately, or, at farthest, within a few minutes after the occurrence of the injury giving rise to the compression. At first there is evidence merely of inflammation; by and by, as the disease advances, effusion takes place, and now the chain of morbid action is completed by the supervention of coma, paralysis, convulsions, and death. This steady progressive movement, from one point to another, can leave no reasonable doubt respecting the true nature of the lesion, especially if it be coupled with a consideration of the history of the case.

The pus may be situated at the same localities as the extravasated blood; but, in general, it will be observed to be either between the dura mater and the inner surface of the skull, or in the anterior and middle lobes of the hemispheres. It is frequently formed, it is true, in the arachnoid sac at the antero-lateral parts of the brain, but rarely in sufficient quantity to produce, of itself, any active compression. When it exists here, it is usually associated with serous effusion, which, being most abundant, becomes in reality the immediate cause of the cerebral trouble. Matter also is seldom effused, at least not to any considerable extent, in the lateral ventricles, whereas an effusion of serum is quite common there. In the majority of instances it will be found, when the compression depends upon the presence of pus, that the fluid is situated in the anterior and middle lobes of the brain, which, if I may be permitted to judge from my own experience, have a greater aptitude for this kind of action than any other portion of the organ. When matter forms in the substance of the brain, it is usually collected into an abscess, which, especially in chronic cases, is sometimes inclosed by a distinct cyst, thick, pulpy, and vascular, and containing a greenish, yellowish, or dark-colored pus, the cerebral tissues around being softened and disorganized.

In regard to the precise situation which the matter occupies, the same difficulty exists, in forming an opinion, as in compression from extravasation of blood. It is only, as a general rule, when the matter lies immediately beneath the skull, and when the scalp or bone has sustained considerable injury, that even an approach can be made to anything like a correct diagnosis. When the pus is deeply buried in the substance of the brain, or lodged in the ventricles, we know of no means by which we can determine its presence. We may, it is true, usually form a tolerably correct idea as to the side on which the effusion exists, by the hemiplegic condition of the body, the right side, for example, being paralyzed when the matter is seated on the left side, and conversely; but to say whether it is situated in the substance of the brain or in its cavities, is an impossibility. In general, it may be assumed that the matter lies immediately beneath the skull when the compression arises from inflammation caused by a bruise or wound of the scalp; when, on the other hand, it follows concussion or fracture of the skull, it will be more likely to occupy the interior of the brain. To this statement, however, there are, of course, many exceptions.

The effusion of matter which induces this species of compression may be the result of concussion, sometimes so slight as hardly to attract any attention; of fracture of the skull, with or without extravasation of blood, and with or without depression of bone; and, finally, of injury of the scalp, in the form, perhaps, merely of a slight contusion or wound, yet sufficient to jar the skull, and detach the pericranium and the dura mater. It is amazing how an apparently trifling accident may sometimes give rise to the most serious consequences, destined to sweep everything before them. A man receives concussion of the brain; his suffering is altogether momentary, and he soon goes about his business; by and by, he begins to feel unwell, his head aches, he has no appetite, his bowels do not act properly, and he sleeps badly at night. Soon symptoms of inflammation of the brain set in, and thus the case progresses, from bad to worse, until effusion of pus takes place, followed by compression. Or, he has met with a fracture, perhaps quite insignificant; he gives himself no trouble about it, and may even entirely disregard the injunctions of his medical adviser. By and by, cerebral symptoms come on; the disease advances insidiously; treatment fails to relieve; matter forms, and the patient perishes from compression. Or, a little bruise has been inflicted upon the scalp, hardly perceptible to the eye, but still sufficient to injure the pericranium; in a few days erysipelas appears; gradually a small puffy tumor forms; rigors, delirium, coma, and paralysis supervene, and the patient finally dies from a collection of pus between the skull and the dura mater, or beneath the dura mater, the inflammation having extended across the bone along the vessels and cellulo-fibrous connections. Or, lastly, the mischief may have been produced by a small wound of the scalp, the blow by which it was inflicted having, perhaps, detached both the pericranium and the dura mater. Again the case advances insidiously; the ill-boding rigor, delirium, stupor, and paralysis soon appear, and but too clearly indicate the formation of pus.

The *treatment* of abscess of the brain is necessarily most unsatisfactory. When there is reason to believe, from the state of the scalp, and the appearance of the skull at the site of injury, that the matter lies immediately beneath the bone, or within the arachnoid sac on the surface of the brain, the removal of a disk of bone by the trephine will, of course, be indicated, but, even supposing that the operation is well performed, and the fluid evacuated, the chances are that the patient will ultimately perish from the mischief sustained by the brain and its envelops during the inflammatory crisis. If, as occasionally happens, a case recovers, it must certainly be regarded merely in the light of a rare exception, and nothing more.

When the abscess is deep-seated, whether in the substance of the brain or in the lateral ventricles, and there are satisfactory evidences of its existence, as indicated by a sense of fluctuation, or by the continuance of deep coma after the removal, perhaps, of a large portion of depressed bone, the surgeon should not hesitate to make a free incision through the superimposed cerebral tissues, in order to afford free vent to the pent-up fluid. Desperate as such a procedure must necessarily be, it is clear that it holds out the only possible hope of relief. In a remarkable case of this kind, Dr. Detmold, of New York, succeeded, by means of repeated incisions, some of them fully an inch and a half in depth, in preserving the life of his patient for seven weeks. An enormous quantity of pus followed the first operation, the patient immediately recovering his consciousness and power of speech.

SECT. IV.—FRACTURES OF THE SKULL.

Fracture of the skull is a frequent occurrence, and is liable, even in comparatively slight cases, to be followed by the worst consequences. It may happen at any portion of the bony case, and may exhibit itself in a great variety of forms, from the merest fissure in the osseous surface to the most extensive loss of substance. In its character, the accident may be simple, compound, comminuted, depressed, or complicated. The import of these terms will be fully understood from what has been said respecting them in the chapter on fractures in general.

All fractures of the skull are the result of external violence, applied either directly to the part, or through the medium of the spinal column. It is remarkable how slight a blow will sometimes produce this injury. Several circumstances may be supposed to contribute to this result, of which the principal are the unusual thinness and brittleness of the cranial bones. It is by no means uncommon to see skulls which are so exceedingly thin as to be quite translucent, not at one point merely, but nearly through their entire extent. My collection contains several specimens, the walls of which are hardly half a line in thickness at the thickest part; they are, in fact, mere shells, composed of compact tissue, with hardly any trace of diploë. Such skulls are also, for the reason just stated, generally very brittle, although this property is by no means peculiar to them, but is often witnessed in comparatively thick crania. When unusual thinness and fragility coexist in a bone, it requires very little force to break it, either at the point struck, or at some opposite one. The fracture will, moreover, be likely to be uncommonly extensive, comminuted, and depressed. On the other hand, the skull may be so thick and hard as to be almost proof against any force, however severe. In one of my specimens, the average thickness of the cranium is at least half an inch, its density is nearly equal to that of ivory, and hardly a trace is to be seen of a suture. To break such a skull, even in a comparatively slight degree, would require an amount of violence which is rarely inflicted under any circumstances.

A very frightful fracture is sometimes produced by indirect violence. It occurs when a person, in falling from a considerable height, alights upon the top of the head, and thus receives the whole weight of the body upon the base of the skull. The atlas, being thus powerfully pressed against the occipital bone, not only breaks it in pieces, but often also the sphenoid, temporal, and frontal bones, as well.

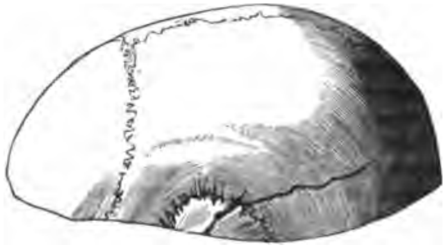
The older writers have much to say about fracture of the skull by *contre-coup;* and in reading their works one cannot fail to be impressed with the conviction that they considered it as an accident of frequent occurrence. Modern research, however, has pointed out the fallacy of this conclusion, by showing that this kind of fracture ranks among the rarest lesions of this portion of the skeleton. The most common site of fracture of the cranium by contre-coup is the base of the skull, from blows upon the vertex. Here the force, instead of being expended upon the part struck, is diffused over the cranium, and finally concentrated upon the sphenoid, temporal, and occipital bones, which are either separated along the line of suture, or broken in their continuity. A similar effect is sometimes witnessed in the occipital bone from blows upon the frontal, and in the parietal bone of one side from force applied to that of the other side.

The subject of fracture of the skull is an exceedingly complex one, and cannot be understood without the most careful and attentive study. The following arrangement will be found to comprise the most important divisions: 1. Simple fracture without depression: 2. Simple fracture, with depression: 3. Simple fracture, with displacement, and compression of the brain: 4. Compound fracture: 5. Fracture of the base of the skull: 6. Punctured fracture: 7. Fracture of the external table alone: and, 8. Fracture of the internal table alone. Finally, there may be depression of the skull, sometimes, indeed, of a very marked character, without fracture, the cranial bones being bent rather than broken.

1. SIMPLE FRACTURE WITHOUT DEPRESSION.

The term simple, as applied to fracture of the skull, implies that the bone alone is involved, or that, if there is any injury of the soft parts, it does not present itself in the form of an open wound. Some contusion of the scalp must, of necessity, always exist, however trifling or insignificant the osseous lesion. Such an occurrence constitutes a complication, but it is very different from a wound communicating with the seat of the fracture, and which, when present, renders the fracture compound. The most simple form in which fracture of the skull occurs is that of a crack or fissure, as in fig. 70, similar to what is observed in a broken pot. It is a mere solution of continuity of the osseous tissue, comparable, in many respects, to a simple incised wound. It is unattended with depression or the separation of any pieces of bone. The fissure may involve the substance of the bone, or it may run along the course of the sutures, its extent varying from a few lines to several inches. It may be caused by direct violence, or, as occasionally happens, by contre-coup.

Fig. 70.



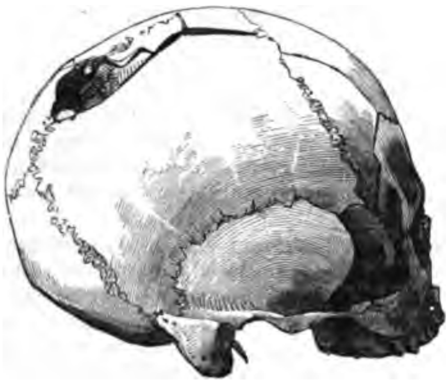
Simple fracture of the skull.

Such a fracture, provided there is no serious lesion of the soft parts, or of the brain, requires none but the most simple treatment. Rest for a short time in bed, an occasional purgative, rigid abstinence, and the avoidance of mental excitement, constitute the principal means of cure. The brain, of course, is carefully watched; for the shock produced by the accident, causing more or less functional disturbance, may be followed by serious inflammation, and that, too, when, perhaps, it is least expected. Operative interference is not thought of; there being no depression of bone, and no extravasated blood to remove. The fissure gradually closes up by bony matter, without encroachment upon the inner table of the skull, and, consequently, without injury to its contents. In these cases, the older surgeons used to trephine, sometimes taking away large portions of the skull, and thus seriously complicating an injury which, at the present day, often gets well under the mildest means.

2. SIMPLE FRACTURE WITH DEPRESSION OF BONE.

This form of fracture is not at all uncommon; the integuments are more or less contused, and the patient is usually severely stunned by the blow or fall by which he has been hurt. The bone is found to be depressed, as in fig. 71, or driven beyond the surrounding level, but not sufficiently far to be productive of compression. If the injury has been very violent, the bone may be comminuted, and some of the pieces may be partially detached, pressing, perhaps, against the dura mater. The great danger from such an accident, after reaction has taken place, is inflammation of the cranial contents, and, remotely, nervous irritation, followed by epilepsy. The question then arises, how shall it be treated? Upon this subject, surgeons have been much divided in opinion, some favoring, others condemning, operative interference; favoring, because of the dreaded primary and secondary effects; condemning, because a simple fracture is thus converted into a compound one. Avoiding both these extremes, as calculated, if fully carried out, to be followed by mischievous consequences, the judicious practitioner will be governed, in the choice of his remedies, by the circumstances of each individual case. When the fracture is of small extent, free from comminution, and without much depression, the best plan will be not to attempt elevation, but to treat the patient upon general principles, using depletion by the lancet and other means, with a view to the prevention of inflammation and other evil consequences. If, on the other hand, the bone is forced down considerably, so as to impinge very decidedly upon the brain, or if it is comminuted or jagged at the edges, the sooner it is raised or removed the better; since, if it be allowed to remain, it cannot fail to become a source of trouble, either by exciting inflammation, or by causing unpleasant secondary effects. I am fully, indeed painfully, sensible of the responsibility which I incur in giving this advice; but I feel satisfied, after mature consideration, aided by the light of experience, that it is the best, if not the only proper, course to be pursued under the circumstances. A man laboring under such an affection is never free from danger; he may get well, or be well to all appearance, and yet be only half cured; for he is subject, at any moment, to have his mind and life imperilled by the broken bone. It is like the sword of the tyrant suspended over the head of his subject.

Fig. 71.



Fracture with depression.

3. SIMPLE FRACTURE WITH DEPRESSION, AND SYMPTOMS OF COMPRESSION.

In this variety of fracture, the bone is not only displaced, but sunk so far below its natural level as to produce compression of the brain. The patient lies in a comatose condition, breathing heavily and stertorously, with dilated pupil, and a slow, laboring pulse, the side opposite to the seat of injury being paralyzed. The symptoms are unmistakable. The fractured and depressed bone, with, perhaps, slight sanguineous effusion, is the cause of trouble. The case, although different from the preceding, has yet much in common with it, the cerebral compression constituting the main feature in the dissimilarity. Here, too, the treatment is not settled, some contending for delay, others for immediate action; the former hoping, by depletion and other means, for cerebral accommodation and prevention of inflammation; the latter trusting, by operative measures, to prevent both present and future evil. Unfortunately, experience, always the best guide in such matters, has not fully decided the question as to which of these two plans should be preferred. Much has been said on both sides; but the tendency, if I mistake not, is decidedly in favor of immediate trephining on the ground that, while the operation adds but little to the risk of the case, the patient has a much better chance of prompt and permanent recovery. As long as the bone is depressed, even supposing that the compression is removed, there is danger of inflammation of the brain and its envelops, to say nothing of the occurrence of epilepsy and other nervous affections, as distressing to the patient as they are embarrassing to the practitioner. My opinion, then, is that operative interference, early and efficient, is, as a general rule, the only proper plan to be pursued under such circumstances. I am sure I should prefer such a course in my own case, if, after all the facts on both sides of the question had been fairly stated to me, I had sufficient judgment left to determine my choice.

4. COMPOUND FRACTURE.

A fracture of the skull is said to be compound when the injury of the bone is associated with a wound in the scalp, communicating with the fissure in the bone. Such a fracture may be comminuted or depressed, or both comminuted and depressed, and attended with or without compression of the brain. The scalp is frequently much contused and ecchymosed, and a good deal of swelling generally arises soon after the occurrence of the injury. The symptoms may be those merely of shock, perhaps severe and protracted, or concussion and compression may coexist, commencing simultaneously, and running on, step by step, until reaction ensues, or until the case terminates in sinking. Hemorrhage, occasionally quite copious and protracted, may attend the accident, adding to the exhaustion of the already enfeebled frame.

The danger of compound fracture of the skull is threefold: from shock, from inflammation, and from fungus of the brain. When the violence to the bone and soft parts has been unusually severe, death may occur without reaction, or after a feeble and unsuccessful show at restoration; or, the first symptoms having passed off, life may be assailed by inflammation; or, this being happily surmounted, the patient may perish from fungus of the brain. When the fracture is very extensive, and is accompanied with great laceration of the dura mater, death may occur from loss of cerebral substance, as in a case which came under my observation in 1852. The patient, a little girl, nearly three years of age, had received a blow from a brick, which literally mashed the top of the cranium, causing extensive laceration of the dura mater, through which the disorganized brain escaped in immense quantity, despite my efforts to prevent it.

The proper *treatment* in compound fracture is to elevate the depressed bone, and to remove any loose or partially detached pieces, this plan being adopted whether there is any compression or not. The case, being a compound one, cannot be aggravated by operation, though it is not to be forgotten that this should be executed with the greatest care and gentleness. The operation is done at once, while the parts are still fresh from the first effects of the injury, and, consequently, prior to the supervention of inflammation. Elevation and retention of the depressed fragments are effected whenever this is practicable, but all loose pieces are removed, as well as such as are nearly detached, lest they should become a source of irritation, either present or future, by acting as foreign bodies. In the compound, comminuted fracture, I have, on several occasions, been compelled to take away an extraordinary quantity of bone, fully equal in size to that of the palm of the hand, and yet recovery followed in almost every instance. The danger of such a procedure is probably not as great as is generally imagined, provided there is no lesion of the brain and its envelops. When these structures are wounded, the case assumes at once a grave character, as there is risk then not only of violent inflammation, but also of loss of cerebral substance and of the ultimate formation of fungus; two circumstances which cannot be too much dreaded. I am averse to the retention of any piece of bone, however large, that has lost all connection with the surrounding parts, believing that its reunion, even if it were possible, which, however, it rarely is, would, from the irregularity of the provisional callus, almost inevitably become a source of mischief, leading perhaps, at length, to the necessity of trephining. Whenever such a procedure is required, due support must be given to the now unprotected brain by sheet lead, compress and bandage, otherwise there may be extensive protrusion of the cerebral pulp before the surgeon is aware of it, the brain rising and tending to escape at every pulsation of the heart. I have found it extremely difficult, in several instances, successfully to counteract this tendency by any means that I could adopt; the consequence was that the patient soon fell into convulsions, and speedily perished.

The offending bone having been raised, or removed, the edges of the wound are gently approximated by suture and plaster, the whole being supported by a compress and roller. The head, previously well shaved, is maintained in an elevated position, and kept constantly wet with cold water, or, what is better, a bladder partially filled with pounded ice, or some refrigerant lotion. If the patient is young and plethoric, and there has been no serious hemorrhage, blood is taken freely from the arm, and by leeches from the temple, the bowels are thoroughly moved by drastic purgatives, and the heart's action is equalized by the antimonial and saline mixture, aided by the moderate use of opiates and veratrum viride. Light and noise are excluded from the patient's apartment, and the diet is of the mildest and simplest character, consisting of a little panada, thin gruel, or arrowroot, along with acidulated drinks.

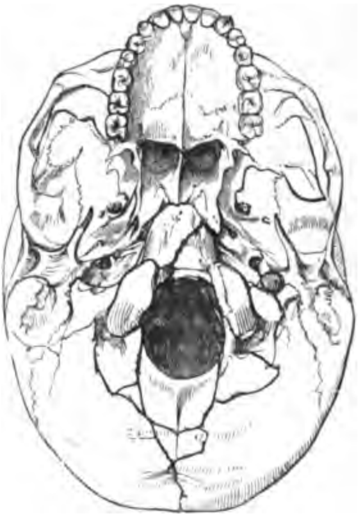
Great prejudice exists in the minds of practitioners against the employment of anodynes in fracture of the skull, even in its worst forms, on account of their supposed tendency to cause congestion of the brain, thereby increasing the danger of inflammation. I believe that this opinion is not only groundless, but fraught with mischief. In the first place, it is by no means established that opiates, judiciously administered, produce cerebral congestion; and, secondly, even supposing that they did, the occurrence would be no contra-indication to their exhibition. If they produce congestion at all, the congestion is of a passive, not of an active character, and, therefore, comparatively harmless. But I do not look upon the subject in this light; on the contrary, I believe that anodynes, by allaying the heart's action, exert a direct and positive influence in controlling inflammation of the brain, by placing the organ in a state of repose, so essential in every case of disease and injury, no matter how induced, or where occurring. The brain, in the normal state, rises and descends with every movement of the left ventricle of the heart; in injury, this action is greatly increased, becoming often quite tumultuous and overwhelming; the nervous pulp receives a shock at each pulsation; it is never at rest, and has, therefore, no opportunity to repair the mischief that has been inflicted upon it. Now the object of anodynes is to insure this result by paralyzing the heart, and thus rendering it unable to send to the brain the accustomed quantity of blood. If this mode of reasoning be correct, it follows that the wounded organ, receiving less blood than usual, will be less prone to inflammation. We can secure repose for it in no other way. We may carry the inflamed hand in a sling, and apply splints to the inflamed leg, but we can insure tranquillity to the brain, heart, lungs, stomach, bowels, and peritoneum only by the use of anodynes. But these remedies do good in another capacity under these circumstances. They induce sleep, allay pain, and quiet the mind; effects which cannot fail to promote recovery, when, from the frightful nature of the injury, recovery is not impossible.

5. FRACTURE OF THE BASE OF THE SKULL.

Fracture at the base of the skull may be perfectly simple; mild symptoms characterizing the affection, and mild remedies sufficing for its relief. But it is far otherwise when the fissure is extensive, owing to the lesion sustained by the brain and its envelops, the former being often severely concussed, and the latter freely detached, large quantities of blood being at the same time frequently extravasated at the site of injury, either in the arachnoid sac or beneath the dura mater. The accident is usually caused by falls upon the vertex, or by the head being crushed laterally, as by the passage of the wheel of a carriage, or by the head being jammed in between two hard and resisting bodies, as a post and a railway car. A fall upon the buttocks, knees, or feet may also produce this fracture, but such an occurrence must be extremely rare, and will be likely to happen only when the cranial bones are uncommonly thin or brittle. In most of the cases of this fracture that have come under my observation, the injury was occasioned by the person pitching, head foremost, from a second story window or a high scaffolding down upon the pavement, the weight of the body being received upon the vertex. In a remarkable instance of this kind, which was treated in 1846 by Professor T. D. Richardson, and which I had an opportunity of seeing soon after the occurrence of the accident, the fracture extended in a circle around the occipital, sphenoid, temporal, and frontal bones, separating them completely from the rest of the skull. The man had been pushed down a high flight of stairs, and in the fall had struck his head violently against the floor. He was immediately picked up in a state of insensibility, in which he continued, without any successful attempt at reaction, until he died, about forty-eight hours afterwards. Dissection showed not only the frightful extent of fracture here indicated, but an immense coagulum at the base of the skull.

The adjoining cut, fig. 72, affords an excellent illustration of the form of fracture now described. It will be observed that the occipital, temporal, and sphenoid bones are most extensively fissured, the injury having been occasioned by a fall upon the vertex.

Fig. 72.



Fissure of the base of the skull.

It is, then, not so much on account of the fracture, as of the great mischief inflicted upon the soft parts, the brain in particular, that this injury is so justly dreaded by the intelligent surgeon. The moment he sees his patient, he is fully impressed with the critical nature of his condition. The symptoms are always of the worst possible description. They are invariably those of concussion and compression, the latter coming on early, and usually continuing, with little or no mitigation, until the close of life. The countenance is deadly pale, the pulse is feeble and hardly perceptible, the respiration is nearly extinct, the pupils are widely dilated, and there is not the slightest sign of sensibility of any kind. Blood often issues from the ears, the nose, and the mouth, from some of the vessels in these parts having given way, in consequence of the severity of the blow or fall inflicting the injury. Occasionally the bleeding from the ears is quite copious, especially when there is fracture of the petrous portion of the temporal bone, and sometimes even when there is merely a rupture of the tympanum. Now and then the blood proceeds from the interior of the skull through a crack in the cranium communicating with the nose, the mouth, and the orbit of the eye, the fluid, in the latter case, sometimes discoloring the conjunctiva and perhaps even the lids. There is also occasionally, as was first shown by Dolbeau, ecchymosis of the posterior wall of the pharynx, extending from the occipital bone to the upper cervical vertebræ, but difficult to be seen, as it is generally concealed by the palate.

When the ethmoid and temporal bones are severely crushed, large fissures may be formed at the base of the skull, admitting of the discharge of a considerable quantity of brain through the ear and nose.

An escape of serosity from the ears is occasionally observed, and great stress is justly laid upon it on account of its supposed diagnostic value. The discharge generally appears within a short time after the accident, and after having continued, often quite profusely, for several days, gradually vanishes. As many as three, four, and even five ounces may be lost in the twenty-four hours, the fluid dropping upon, and saturating the patient's pillow. It is strongly saline in its taste, of a clear watery aspect and consistence, and entirely destitute of coagulability, containing merely a trace of albumen, and differing, therefore, essentially from ordinary serum. The source of this discharge has been variously explained, but the most plausible theory is that it consists of the cephalo-spinal liquid, and that its evacuation through the ear is effected by the rupture of the cul-de-sac of the arachnoid membrane which surrounds the auditory nerve as it passes along the auditory canal in the petrous portion of the temporal bone. This view of the case is certainly very strongly favored by the similarity in the physical and chemical properties of the two fluids, and by the fact that the serous investment of the brain has been found to be torn completely across, opposite the outlet at which the escape has been observed to take place. The discharge is usually most abundant, as well as most common, in young subjects.

The *diagnosis* of fracture at the base of the skull is not, I think, as difficult as is generally supposed. The history of the case, the coexistence of violent concussion and compression, the profound coma and insensibility, the absence of fracture at the more accessible portions of the cranium, and the obstinate persistence of the symptoms, are sufficiently declarative, in most cases, of the nature of the accident. The inferences derived from these sources will be materially strengthened, if there is at the same time a discharge of blood from the ears, profuse, and continued, as it will be likely to be when there is fracture of the petrous portion of the temporal bone. A flow of serosity from these passages is an infrequent, but, diagnostically considered, a most valuable occurrence, as it always affords indubitable evidence of the lesion in question. The same is true of the discharge of cerebral matter from the nose and ears. Bleeding from the nose and mouth and discoloration of the conjunctiva and eyelids may proceed from other causes, and cannot, therefore, be rendered available in the discrimination of the present affection.

Fracture at the base of the skull is one of the most serious of accidents. If it does not always terminate fatally, the number of recoveries is so few as to form merely an exception to a law which is by many regarded as general. I have, myself, out of at least a dozen cases of the kind, witnessed only one restoration. That the injury should usually end in this way is not surprising, when we reflect upon its violent and complicated character, and upon the fact that, under any circumstances, hardly anything is to be effected by treatment, which is obliged to be altogether expectant. Operative interference is, of course, wholly out of the question. The only thing to be done, in the first instance, is to endeavor to establish reaction, and, if this should fortunately take place, afterwards to employ means for averting inflammation. In most of the cases that have come under my observation, the patient never recovered from the unconscious and exhausted condition consequent upon the first blow, death having usually occurred before the end of the third day.

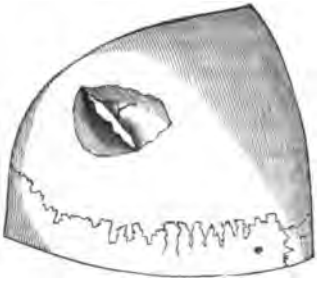
In fracture of the base of the skull, involving the petrous bone, and followed by the recovery of the patient, an emphysematous tumor, technically termed *pneumatocele*, occasionally forms behind the ear, from which it gradually extends over a considerable portion of the posterior and upper part of the head. It is painless, elastic, and free from fluctuation, emitting a tympanitic sound on percussion. During expiration, if the nose and mouth are closed, the air escapes with a hissing noise through the ear, and the swelling collapses measurably, if not entirely, under the pressure of the hand, but reappears the moment the pressure is discontinued. The affection evidently depends upon fracture of the petrous bone by contre-coup, establishing a communication between the cavity of the tympanum and the areolar tissue beneath the scalp. Three well marked cases of it have been described, respectively, by Jarjavay, Balassa, and Chavance. The treatment consists in the introduction of a seton with a view of provoking adhesive inflammation. The cure is generally tedious.

6. PUNCTURED FRACTURE.

A punctured fracture is a small, circumscribed opening in the skull, attended with depression of both tables, the inner, however, being always more displaced, as well as more badly broken, than the outer. It derives its name from its size, which is often quite insignificant, and from the circumstance that it is invariably produced by a narrow weapon, as a poker, bayonet, or dirk. It is sometimes caused by a fall upon a nail, a sharp stone, or the top of an iron rail; and I have seen several cases where it was produced by a blow with a brick, the angle striking the bone. From the manner in which the injury is inflicted, there is always necessarily severe contusion of the scalp, if not laceration of its entire thickness, constituting, in the latter case, a compound fracture.

The annexed drawing, fig. 73, from a preparation in my collection, affords an excellent idea of the nature of this variety of fracture. The case was neglected, or mismanaged, and the man died in three weeks, from abscess of the anterior lobe of the brain, caused by the pressure of the depressed bone.

Fig. 73.



Punctured fracture of the skull.

Punctured fracture is not often attended with compression; for, although the inner table of the cranium may be considerably depressed, there are few cases where it causes such an amount of pressure as to produce this effect. Sometimes a sharp spicule of bone dips down into the membranes of the brain, and even into its substance, sadly complicating the case. The accident is always easily recognized by inspection and digital exploration, aided, if necessary, by the probe, the latter often affording important information relative to the nature and extent of the depression. However simple, a punctured fracture of the skull should always be regarded as a most serious lesion, from which, unless it is properly understood and treated, few persons ever make a happy escape. The great danger is inflammation of the brain and its membranes, frequently coming on within a few days after the accident, and sure to terminate fatally, if the case has been neglected or mismanaged. Should the patient be so fortunate as to escape with his life, he can scarcely fail to suffer afterwards from cerebral irritation, especially epilepsy and mental imbecility. In view of these occurrences, practitioners have long been agreed that the proper treatment is trephining, performed at the earliest possible moment, and without the slightest regard whatever to the character of the head-symptoms; or, in other words, as to whether there is compression or not.

It is sometimes very difficult to persuade a patient, when he has merely a little hole in his cranium, without pain, headache, or any other symptom of consequence, to submit to what he may regard as so serious an operation as that of boring the skull. I recollect a sad instance where a man lost his life from this cause. He had been struck, early one morning, with a brick upon the head, resulting in a punctured fracture over the middle of the left parietal bone. He was stunned for a few minutes by the blow, but soon recovering, he immediately mounted his horse, and rode to my office, a distance of nearly two miles. Upon his arrival, he was in every respect comfortable, except that he complained of a little soreness of the scalp. Discovering the nature of the fracture, I pointed out to him very fully its dangers, and begged him to submit without delay to an operation for his relief. To this, however, he would not consent, and I accordingly dismissed him, having previously enjoined absolute rest, light diet, and constant elevation of the head, with cold water-dressing. Two days afterwards I was sent for, having been informed that he was very unwell. I found him quite feverish, with a tendency to delirium. Again an operation was urged, and again declined. He grew gradually worse, and on the seventh day, when he was in a comatose condition, his wife permitted me to use the trephine. No relief followed the operation, and he died in thirty-six hours. Pus and lymph were found at the seat of the injury, where the brain was also slightly softened, and the lateral ventricles contained several ounces of serum. Who can doubt that this man lost his life by his obstinacy and folly? If he could have been immediately trephined, there is reason to believe that he would have made a speedy and perfect recovery.

7. FRACTURE OF THE EXTERNAL TABLE ALONE.

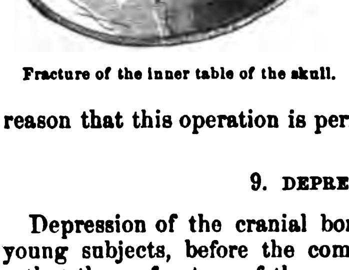
This species of fracture is extremely rare, and can happen only in the adult, or in persons whose cranial bones have a distinct diploë. Moreover, its occurrence implies unusual brittleness of the outer table, and inordinate firmness of the inner. The fracture is generally of small extent, and the depression inconsiderable. The most common cause is a blow from a narrow, blunt-pointed body. Besides being momentarily stunned, the patient suffers no particular inconvenience, save what results from the scalp-lesion. The diagnosis of such a fracture must necessarily be obscure, and, unless great care is taken, it might easily be confounded with a common punctured fracture. Mistake will best be avoided, in case of wound, by the careful use of a fine probe, carried around the edge of the depressed bone, by the pressure of the finger, and by filling the artificial hollow with water. If the probe enter any side crevices, the finger cause motion, or the water disappear, there will be strong reason to conclude that the fracture involves both tables of the bone, and that it is of a punctured nature. The injury requires no particular treatment, apart from that which may be necessary on account of the lesion of the scalp and brain.

A fracture of the outer table of the frontal sinus is sometimes met with. I saw a singular case of this description a few years ago, along with Dr. Ronalds, in a lad, eight years old, from a blow with a piece of brick. The outer table of the left sinus was broken at several points, and knocked considerably below the natural level. A wound, one inch long, existed on the left eyebrow. In attempting to raise the depressed bone, which I succeeded in doing with a delicate and slightly curved awl, the boy had a violent convulsion, but from this he soon recovered, and he had no bad symptoms afterwards.

8. FRACTURE OF THE INTERNAL TABLE ALONE

This fracture, fig. 74, is still more rare than the preceding; indeed, it is so uncommon that many surgeons of large experience have denied the possibility of its occurrence. I have myself never seen an instance, but well-authenticated examples of it have been reported by Tulpius, Paré, Delamotte, Borel, S. Cooper, and Huguier. In most, if not in all, of these cases, the fracture was caused by the blow of a bullet, or some other concentrated violence, sufficient to break the inner table without cracking the outer. The lesion is seldom discovered until after death, and then, perhaps, only accidentally, as it does not give rise to any marked, much less characteristic, symptoms. When it is suspected to exist, and especially when there is concomitant compression, the proper remedy would be the trephine, for the same reason that this operation is performed in punctured fracture.

Fig. 74.



Fracture of the inner table of the skull.

9. DEPRESSION WITHOUT FRACTURE.

Depression of the cranial bones without fracture can take place only in very young subjects, before the completion of the ossific process. It is a bending rather than a fracture of the osseous fibres, and is confined chiefly, if not entirely, to the frontal, parietal, and occipital bones. It is usually produced by a fall from a considerable height, in which the child alights upon the top of the skull, which is sometimes flattened in a most grotesque manner, and in a most extraordinary degree. I have seen only three instances of this occurrence, one of which made a great impression upon me at the time, on account of its novelty and extent. It happened in a child two years and a few months old, who, in falling down a long flight of stairs, struck its head violently against the floor. It was picked up in a state of insensibility, and, for a few minutes, it was supposed to be dead. Signs of reanimation, however, soon appeared, and in a few hours the reaction was perfect. The anterior and upper portion of the skull was completely flattened, the frontal and parietal bones being pressed out in such a manner as to give the head a most singularly deformed appearance. The child lay for the latter part of a day in a comatose condition, with frequent spasmodic twitches, but no decided convulsions; both pupils were dilated, but not altogether insensible to light; and the pulse, after the subsidence of the shock consequent upon the fall, was slow and labored. Under mild treatment, these symptoms gradually disappeared as the depressed bones regained their natural level, which they did in less than a week from the time of the accident. In another case, the depression was much less, and the effect proportionately milder. In the American Journal of the Medical Sciences for August, 1840, a very extraordinary instance of this accident is related by one of my former pupils, Dr. Burt, of the Navy. A child, three years old, fell out of a second story window, head foremost, upon the pavement below, a distance of sixteen feet, knocking the skull as flat as a board, the frontal bone projecting two inches over the eyebrows. For an hour the child had symptoms of violent concussion; then slight convulsions came on, followed by vomiting, which afforded great relief. The treatment consisted of cold applications to the head and of gentle cathartics. No fracture could be detected. The bone speedily began to resume its natural position, and in a short time the skull had regained its former shape.

Depression of the skull unaccompanied by fracture occasionally exists without any serious symptoms. Thus, in a case reported by Green, the patient experienced no particular inconvenience, although the hollow in the bone was sufficiently deep to receive the bowl of a dessert-spoon.

In cases similar to those now mentioned, the *treatment* resolves itself into the adoption of the most gentle measures, as leeches and cold applications to the head, purgatives, and stimulating enemata. If the patient is very plethoric, blood may be taken from the arm, but in general this will be unnecessary. The bone will gradually resume its natural position, by its own resilient powers and the pulsatory movements of the brain. All interference with the trephine is, of course, avoided.

If the child is very young, an attempt may be made to raise the bone by suction with a cupping-glass, as recommended by Hildanus, and practised successfully in 1849, by Dr. W. L. Moultrie, of Charleston. The depression, in this case, occupied the parietal bone, and was large enough to contain with ease the bowl of a comman tablespoon. The instrument having been properly adjusted, and exhausted of air, traction was made upon it with the effect of rapid and complete restoration of the entire surface to its natural level. The child, which was five months old, recovered without any untoward symptom. A case of a similar nature has been reported by Dr. Nicolls, in the Dublin Medical Press for September, 1853. The depression, which was deep, narrow, and about three inches in length, was promptly raised by a cupping-glass placed upon an embankment of common glaziers' putty, in order to afford the instrument a proper purchase. The child was two years old.

10. APPARENT DEPRESSION.

The practitioner is sometimes sorely puzzled to determine whether what he sees and feels upon the skull is really a depression of the bone, or merely a deceptive appearance. Of this occurrence I have seen several well-marked instances, and, as it is by no means uncommon, it is very important that we should be acquainted with its true character, lest we be tempted to use the trephine in cases which will either yield to very slight treatment, or where, from the injury done to the brain, treatment of every description is hopeless. The manner in which it is produced is easily understood. A man receives a blow or fall upon the head, severely contusing the scalp, and perhaps inflicting serious injury upon the cranial contents. Upon examination, a tumor is found, having a depressed centre and elevated edges, its size perhaps equalling the palm of a small hand. The depression indicating the spot upon which the violence was concentrated, is due solely to the condensation of the tissues of the part; while the tumor itself is caused by the blood that is extravasated at the time of the accident, and which now distends the cells of the adjacent structures.

The first case in which I ever noticed this occurrence was that of an elderly man, who was picked up in a state of coma from a fall which he had received a short time previously from a second story window upon the pavement below. The tumor, which was uncommonly large, existed upon the right side of the head, over the parietal protuberance; its edges were remarkably prominent and well defined, and the central cavity felt precisely as if it had been caused by a fracture with depression of the bone. A careful examination, however, satisfied me that the appearance was altogether deceptive, and the death of the man, occurring nine hours afterwards, confirmed the accuracy of my diagnosis. The parietal bone was perfectly sound, but one of the most extensive fractures that I have ever known, existed at the base of the skull, along with immense effusion of blood.

A boy, aged sixteen, in riding rapidly round a race-course, was pitched, head foremost, off his horse against the earth, the animal being at the time under full speed. He was picked up in a state of utter insensibility, and a large tumor was discovered just above the left eyebrow, with a well marked central hollow. Although convinced that the bone beneath was sound, I was induced, at the earnest entreaty of Dr. Knight and Dr. Wakefield, to cut through the part, but found no fracture. The lad never recovered his consciousness, and died in a few days after the receipt of the injury. An extensive fracture existed at the base of the skull.

A lad, eleven years old, a patient of Dr. O'Reilly, was thrown off his horse, striking his head violently against a fence. On the right side of the head, just in front of the temple, was a severe contusion, feeling very soft, and readily permitting the finger to sink down into it at the centre, thus imparting the sensation of a badly depressed fracture. The lad had been somewhat stunned, but soon regained his consciousness. Being in doubt whether the appearance was real or not, I made a small incision across the swelling, down to the bone, but there was no fracture. Recovery occurred without an unpleasant symptom.

To the above cases I might add several others, but as they are sufficiently typical of the occurrence in question this will be unnecessary. What increases the embarrassment in such cases is the fact that the deceptive appearance of the scalp is often associated with symptoms of compression of the brain, inducing the idea that the cerebral affection might be caused by depression of the skull.

Doubt may sometimes be thrown upon our diagnosis by malformation of the skull. A man, aged thirty-two, came under my observation, on account of a wound upon the posterior part of the head, received a week previously by being struck with a piece of iron. He was stunned by the blow, and for several days he was hardly able to walk across the room. The wound, which was about two inches and a half in length, extended down to the bone, and was situated over a ridge just behind the lambdoidal suture. On passing my finger around the wound, I found, immediately in front of it, a broad, deep hollow, reaching forwards towards the sagittal suture, and looking very much like a depression from a fracture. Upon inquiry, however, I ascertained that it had always existed there, having been the result of malformation. The patient, on his entrance, had violent headache, along with considerable fever, for which he was bled and purged, and from the effects of which he soon recovered. Had he labored under compression of the brain, the deceptive appearance caused by this state of the bone might have induced an incautious surgeon to apply the trephine.

It is hardly probable that any surgeon, at the present day, would mistake a suture of the skull for a fracture. Such an error is said to have been committed by Hippocrates, who actually applied the trephine for the relief of his patient. An accident like this could only be excused in a case where symptoms of compression are superadded to the depressed appearance of a bone from malformation, the suture running across its surface, and the scalp being more or less contused from the injury.

SECT. V.—SECONDARY EFFECTS OF INJURIES OF THE BRAIN AND SKULL.

Among the more common of the secondary effects of injuries of the scalp, skull, brain, and cerebral meninges are abscesses in other parts of the body. The organs which are most liable to suffer in this manner are the liver, lungs, spleen, and kidneys. Collections of pus also sometimes occur within and around the larger joints, and in the connective tissue beneath the skin and among the muscles.

Abscesses of the liver are particularly liable to form during the progress of injuries of this kind, and their occasional occurrence attracted the attention of surgeons long before anything was known of pyemia, of which they are evidently merely a consequence. They rarely arise until several weeks after the accident; but now and then an instance is met with where they are developed at an unusually early period, as in the remarkable case recorded by Hennen, of a woman in whose liver pus formed in less than two days after the receipt of a blow upon the head. It is generally supposed, and not without reason, that these secondary abscesses of the liver are most liable to take place in persons of intemperate habits and broken constitutions. A jaundiced condition of the body, apparently caused by mere functional disorder of the liver, not infrequently supervenes upon injuries of the head. I have seen many such cases.

Pyemic abscesses of the lungs are less frequent than in the liver; congestive pneumonia, however, is by no means uncommon, and often proceeds to softening and grayish hapatization, eventuating in death. Sero-purulent effusions are sometimes found in the thoracic cavities; and cases have been noticed of extensive tuberculization of the lungs. Marchetti met with a case of abscess of the heart after an injury of the skull. Secondary formations of this kind are uncommon in the spleen and kidneys.

The occurrence of abscesses in these organs is generally indicated by more or less violent rigors, an icterode state of the eye and face, delirium, and excessive prostration. The attack is commonly insidious; hence the true nature of the disease is frequently overlooked until it is too late to afford relief. The treatment must be essentially supportive. If matter point externally, the proper plan is to use the knife.

Erysipelas, as an effect of this class of injuries, is sufficiently common, especially in camps and hospitals, in persons of dilapidated health and intemperate habits. It generally comes on within the first four or five days after the accident, for the most part upon the scalp and face, but sometimes also in the extremities, and constitutes one of the most serious complications to which such patients are liable. It may follow the most insignificant as well as the most violent injury; and requires the same treatment as erysipelas arising from other causes.

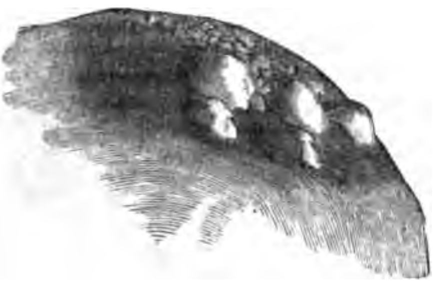
Tetanus is an occasional consequence of injury of the head, but less frequently than might, at first sight, be supposed. In the table of Mr. Curling, embracing 128 cases of traumatic tetanus, the wounds in 11 were either on the scalp or face.

The tendency to *relapse*, after injuries of the head, has long been familiar to surgeons, and cannot be too strongly insisted upon. "Slow as the brain is in some cases," says Hennen, "to take on diseased action, it is amazingly irritable in others." Hence the patient cannot be too sedulously watched, or subjected to too rigid hygienic regulations. Every symptom, however trivial, should be regarded not only with suspicion, but most rigorously scrutinized, with a view, if possible, of determining its pathological import.

SECT. VI.—DISEASES OF THE CRANIAL BONES.

The cranial bones now and then suffer from *exostosis*, of which there are two distinct kinds, the ordinary and the syphilitic. The former, which is often caused by external injury, is most common about the forehead, and may, in time, acquire a considerable bulk, although in general it is small. Its structure is either comparatively soft and spongy, or hard and dense, like ivory. It seldom extends beyond the outer table of the skull, and has usually a tolerably broad base. Occasionally several such growths occur on the same bone, as seen in fig. 75. The proper remedy is removal. When the exostosis extends inwards, or grows from the inner surface of the cranium, inducing neuralgia or epilepsy, and the diagnosis is sufficiently obvious, the offending structure should be removed with the trephine.

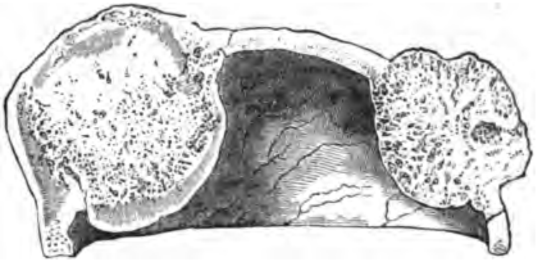
Fig. 75.



Ivory-like exostoses of the skull.

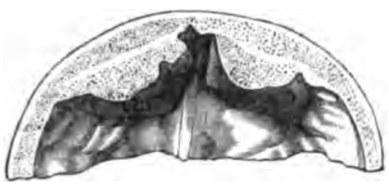
The *syphilitic* form of exostosis is occasionally met with as a tertiary symptom, being most common in persons whose system has been injured by the conjoined effects of the syphilitic poison and of mercury. The forehead is the most common site of the morbid growth, which is often multiple, and not infrequently appears simultaneously on both surfaces of the cranial bones. Its base is broad or diffused; its structure soft and porous. The disease is always accompanied by tenderness on pressure, and by fixed pain, liable to nocturnal exacerbations, which, together with the history of the case, generally readily distinguish it from the ordinary affection. When a tumor of this kind forms on the inner surface of the skull, it must necessarily cause more or less cerebral disturbance. The treatment is similar to that of tertiary syphilis in other parts of the body. The annexed sketches, figs. 76, and 77, exhibit these formations on both surfaces of the skull.

Fig. 76.



Syphilitic exostoses of the skull both external and internal.

Fig. 77.



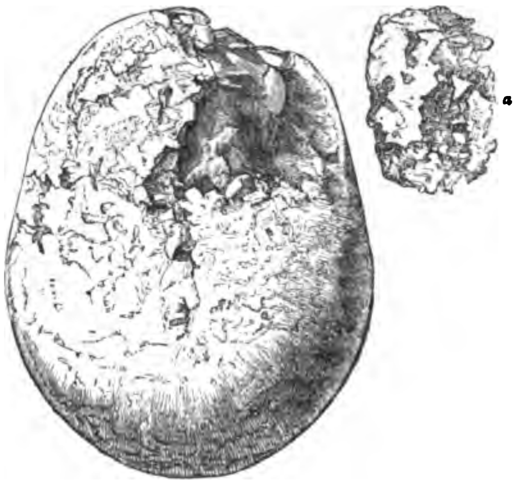
Syphilitic exostosis of the inner surface of the skull.

A species of general *hypertrophy* of the bones of the skull is sometimes met with, either as the result of external injury, as a blow on the head, or, as more frequently happens, as an effect of the syphilitic virus. It is characterized by extraordinary density of structure, by complete effacement of the diploë, and by great increase of weight and thickness of substance. The treatment must be regulated according to the nature of the exciting cause.

Caries of the skull, fig. 78, is usually the result of constitutional taint, and sometimes attacks every bone, completely riddling both tables, and causing the most frightful suffering; the scalp is studded with ulcers, the discharge is foul and fetid, and the general health is sadly undermined. The affected bone often perishes, seldom, however, in its entire thickness, the external table being much more frequently involved than the internal. The treatment must be in strict conformity with the nature of the exciting cause. Great attention must be paid to cleanliness, fetor is allayed with the chlorides, and dead bone is removed as soon as it is sufficiently detached.

Caries and necrosis of the cranium from ordinary causes are uncommon. Serious mischief of this kind may arise from a simple blow upon the head, with or without scalp-wound, provoking inflammation and suppuration of the pericranium, which, becoming detached, occasions destruction of the osseous tissues. The effect may be limited or diffused, attacking one or both tables of the bones, and sometimes, although very rarely, involving almost the entire calvaria, as in the remarkable case of Saviard, in which, two years after a blow on the head, the whole skull-cap came away in one mass.

Fig. 78.



Syphilitic caries of the skull; at *a* the bone is necrosed.

Terrible injury is sometimes inflicted upon the cranium in *burns*, from the accidental fall of the patient into the fire during an attack of epilepsy or a fit of drunkenness. In a case of this kind, under my observation, in 1860, in a man upwards of fifty years of age, the whole skull-cap had been completely detached some time previously, and its place occupied by a new shell of bone, covered with beautiful granulations, bathed in thick, healthy pus. The parts were progressing favorably under simple dressings, and the man was in other respects perfectly well.

Injury inflicted upon the *diploë*, in which this substance is more or less severely bruised, shaken, or disorganized, is liable to be followed by grave inflammation, acute or chronic, eventuating in the formation of pus, either in its own structure, beneath the pericranium, or between the dura mater and skull, considerable portions of which sometimes perish from the destruction of their vascular connections.

The *treatment* of these affections is to be conducted upon strictly antiphlogistic principles, copious leeching, vesication, and free incisions being among the more important measures. Matter must be promptly evacuated, and dead bone removed as soon as it is sufficiently loose. The brain and its membranes are carefully watched, that they may not suffer from secondary involvement.

The diploë is occasionally the seat of *aneurism by anastomosis*, arising either as a congenital defect, or as a consequence of injury. As the morbid growth advances, it causes absorption of the tables of the bones, and in this way a large tumor may ultimately be formed, pulsating synchronously with the heart's action, diminishing under pressure, and augmenting when the patient cries or makes any violent exertion.

Very little can be done for this disease, in the way of treatment, beyond keeping the patient quiet, and obviating all sources of mental excitement. In its earlier stages trial may be made of gentle pressure or of subcutaneous ligation. The common carotid artery has been tied for it in a number of cases, but not, so far as I know, in a solitary one with any marked benefit.

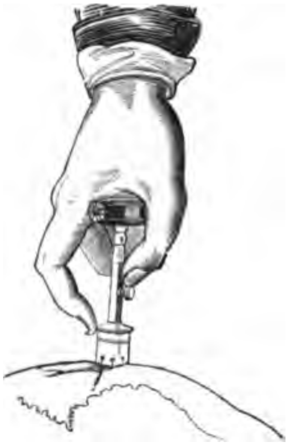
Finally, the cranium may be affected with *fistule*, as a result either of injury or of organic disease. The nature of the lesion is generally easily detected with the probe; or, when this fails, by filling the passage with water, and then, while the opening in the integuments is made the most elevated point, requesting the patient to take a deep inspiration. The water, if a fistule really exists in the bone, will now disappear, but will immediately be expelled during forced expiration. The proper remedy is to remove the disease which has caused the fistula.

SECT. VII.—OPERATION OF TREPHINING.

The circumstances which require this operation are:—1. Compound fracture with depression of the bone, with or without symptoms of compression. 2. Simple fracture with depression and symptoms of compression after a fair trial of ordinary means. 3. Punctured fracture, no matter what may be the condition of the brain. 4. Extravasation of blood between the skull and dura mater, or in the arachnoid sac on the cerebral hemispheres. 5. The existence of pus in the same situations. 6. Foreign bodies. 7. Epilepsy, and other secondary effects.

In performing the operation, the patient is placed upon a narrow dining-table, or lounge, the head and shoulders being properly elevated by pillows, covered with a sheet and a piece of oil-cloth. If he is faint, the less the head is raised the better. The scalp being extensively shaved, the bone is exposed by a suitable incision, of which the semilunar, T-shaped, V-like, or crucial, are the most common. Sometimes the bone is sufficiently denuded by the accident, or so nearly so as to render but little dissection necessary. In no event should any portion of the scalp, however severely it may be lacerated or contused, be cut away. The bleeding which follows the use of the knife usually ceases in a few minutes of its own accord; should it not do so, it is easily arrested by the ligature, though this should always, if possible, be avoided, as it has a tendency to interfere with the adhesive process. The periosteum, upon the integrity of which the welfare of the bone so essentially depends, is cautiously dealt with, the flaps being, if practicable, drawn towards the sides of the wound, and carefully held there until the operation is completed. I am sure that if more attention were paid to this subject than there is, there would be much less danger of exfoliation of the bone; an occurrence which often greatly retards the cicatrization of the parts, and leads to much pain and inconvenience. All scraping is inadmissible.

Fig. 79.

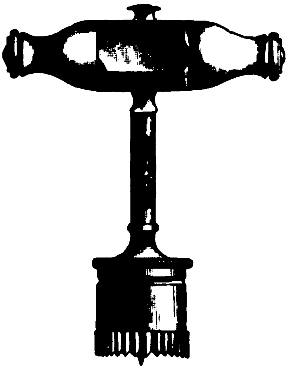


Application of the trephine.

The crown of the trephine, of which there should be several sizes, is planted upon a sound portion of the bone, as in fig. 79, to a degree just sufficient for the accommodation of the centre-pin, which is always protruded at the moment of the application. The instrument is then moved by semicircular sweeps from left to right and right to left, until it has formed a groove deep enough to maintain its place, when the pin is permanently retracted, lest, upon reaching the inner table, it pierce the cranial contents. The saw-dust is removed from time to time from the trephine with a brush, or, what is preferable, a wet sponge, and from the track in the bone with a toothpick. Approach to the diploë, if any be present, is indicated by greater freedom of motion, a more abundant flow of blood, and a less grating sound. The instrument is now turned with more and more caution, and in such a way as to divide the inner table simultaneously at every point. There is no necessity for any hurry; the patient is frequently insensible from the accident, or is rendered so by chloroform, and hence the whole proceeding is conducted in the most deliberate manner, the operator constantly bearing in mind that any injury, however slight, which he may inflict upon the brain and its membranes, may seriously compromise the patient's safety. The disk of bone frequently comes away in the saw; when it does not, it is readily raised with the finger, forceps, or elevator. All depressed pieces of bone are next elevated, and all loose pieces removed. The edges of the osseous orifice are smoothed with a raspatory, blood and other extraneous matter are carefully cleared away, bleeding vessels are tied, and the wound in the scalp is accurately secured by suture and plaster, a small interspace being left for drainage, unless there is the strongest reason to believe, from the appearance of the parts, that they will unite by the first intention. Over this dressing is applied a tolerably stout compress, confined by a roller, to support the beating brain, and prevent the occurrence of fungus.

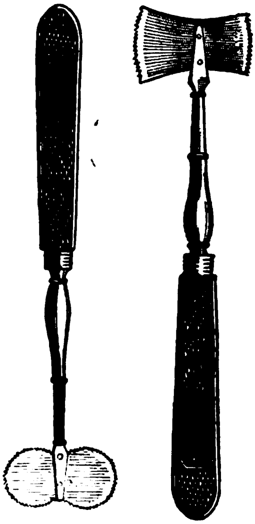
The annexed cut, fig. 80, represents the trephine which, from long habit in its use, I prefer to any other. It is a very beautiful instrument, and such is the facility with which it may be worked that, unless the skull is of extraordinary density, the operation may generally be accomplished in a very short time. The other instruments which usually accompany the trephine are a pair of Hey's saws, fig. 81, or, more properly speaking, the saws of Scultetus, an elevator, fig. 82, a lenticular, fig. 83, and a raspatory.

Fig. 80.



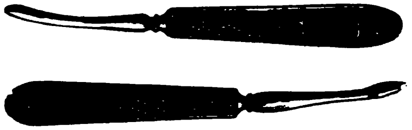
Common fluted trephine.

Fig. 81.



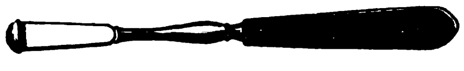
Different forms of saws.

Fig. 82.



Different forms of elevators.

Fig. 83.

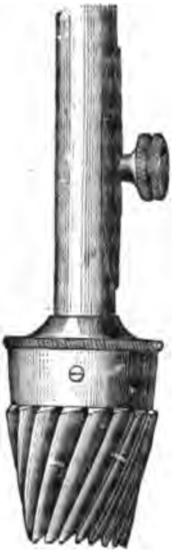


Lenticular.

The old conical trephine, depicted in the works of Heister, was reintroduced to the notice of the profession by Dr. Galt, of Virginia, in 1860. It consists, as seen in fig. 84, of a truncated cone, the surface of which is furnished with numerous sharp spiral teeth, which thus greatly facilitate the perforation of the bone, while the instrument, from its peculiar shape, ceases to act the moment the penetration is effected, and so prevents all risk of injury to the brain and its membranes.

There are certain points of the skull where, if it is possible to avoid it, the trephine is never applied. These points are the frontal sinus, the anterior inferior angle of the parietal bone, the course of the longitudinal sinus, the occipital protuberance, and the different sutures. The reasons for this injunction are sufficiently obvious. Exposure of the frontal sinus might lead to a fistulous orifice, attended with a constant escape of air and mucus; at the second place indicated is the middle artery of the dura mater, running sometimes in a deep furrow of the bone; at the top of the skull is the longitudinal sinus; and in the occipital region there is not only inordinate thickness of bone, but danger of interfering with the lateral sinus. Should an operation at any of these situations become imperative, the greatest caution should be employed in its execution. When the frontal sinus is obliged to be penetrated, two trephines must be used, a large one for the external table, and a smaller one for the internal.

Fig. 84.



Conical screw trephine.

The operation being over, the patient is placed in bed with his head and shoulders well elevated, and subjected to the most rigid antiphlogistic regimen. The great danger, of course, is inflammation of the brain and its meninges, and hence the head should be most diligently watched, in order that the earliest moment may be seized to counteract the slightest untoward occurrence. The dressings are removed from time to time, as they become soiled, or a source of irritation, and great care is taken that the formation of pus beneath the replaced scalp does not become a cause of cerebral oppression. Should this be found to be the case, the dressings must immediately be removed, and, if necessary, a puncture made through the superimposed parts, to afford a proper outlet to the pent-up fluid.

The opening left by the trephine is generally closed by fibrous tissue; sometimes by fibro-cartilage, and occasionally, though very rarely, by a thin stratum of osseous substance. The site of the injury is ever afterwards indicated by a depression in the skull, and for a long time the pulsations of the brain are perceptible across the adventitious structure. As this matter remains weak and thin for years, and, consequently, affords but a very imperfect protection to the brain, the opening should be kept constantly covered with some suitable contrivance, as a piece of leather, silver, or gutta-percha. For want of this precaution, fatal accidents have occasionally occurred.

The operation of trephining has been followed by different results in the hands of different surgeons. In general, they are anything but flattering. In the hospitals of Paris and Vienna the operation is nearly always fatal; in London, Dublin, Edinburgh, Glasgow, and other large cities of Great Britain, the mortality, although also very high, is much less; and in the United States, the number of recoveries in proportion to the number of deaths is, as nearly as we can arrive at the matter, as one to four. From the statistical accounts, by Dr. Lente, of fractures of the skull, in the New York Hospital, it appears that eleven cases out of forty-five that were subjected to this operation were cured. There is reason to believe that the greatest success of the trephine is to be found in private practice. My own experience has furnished me with a number of excellent recoveries, and some of my friends have been equally fortunate. The mortality of the operation will, of course, be materially influenced by the nature of the case, the character of the existing complication, the habits of the patient, and various other circumstances, which will readily suggest themselves to the mind of the reader. The operation itself is not free from danger, as is proved by the fact that it is often fatal when it is performed for the relief of epilepsy and other severe nervous symptoms.

Trephining in Epilepsy.—The operation of trephining is occasionally performed for the relief of epilepsy consequent upon neglected cases of depressed fracture of the skull. The first attempt of this kind was made by La Motte, in 1705, but with only partial success. In 1804, Mr. Cline, of London, recalled attention to it by the publication of a successful case; and since then it has repeatedly been performed for this purpose both in Europe and in this country. Dr. Dudley in 1828 published a valuable paper upon the subject in the first volume of the Transylvania Journal of Medicine, in which he detailed the particulars of five cases of epilepsy treated with the trephine, of which three were successful. The results of the practice of other surgeons have not, however, been so flattering. I have myself had occasion to perform the operation four times, with the effect of one cure and three deaths; and I have witnessed its execution in three other cases, all of which terminated fatally. Nearly all the patients perished within the first week from inflammation of the brain and its envelops, evidently induced, not by any direct injury inflicted upon these structures in the operation, but by the disturbance of the cerebral circulation consequent upon the removal of the depressed bone. The event in question occurred in all these cases, notwithstanding the most thorough preparation of the system, and the most assiduous attention during the after-treatment. In one of my own cases, that oı a man aged thirty-three, whom I trephined at the Clinic of the Jefferson Medical College, in 1857, the cause of death was quite unique. The depression, which had existed ever since he was eight years old, involved the upper portion of the parietal and frontal bones, and was nearly two inches in diameter, by upwards of half an inch in depth at its centre. At the age of twenty-two epileptic convulsions set in, and continued to recur, with increased severity and frequency, up to the time of the operation. Latterly his speech, memory, and general health had become so much impaired as to render him unfit for business. A large disk of the depressed bone being removed, the case seemed to progress favorably for forty-eight hours, when, stupor and spasms coming on, he gradually lapsed into a state of unconsciousness, and died five days afterwards.

The dissection revealed the existence of extensive softening of the cerebral hemisphere at the site of the depression and an enormous effusion of black blood, with an opening in the membranes of the brain large enough to receive the end of the index finger. This opening, which was noticed at the time of the operation, was produced by the pressure of a small exostosis on the inner surface of the injured bone, and permitted a free escape of the cephalo-spinal fluid, both during and after the operation. The pressure upon the brain being thus removed, the diseased vessels at the seat of the softening gave way, thereby causing fatal apoplexy.

Dr. John S. Billings has given an analysis of 72 cases of epilepsy, subjected to trephining, of which 42 were cured, 4 were unchanged, 16 proved fatal, and the remainder were improved, but not entirely relieved.

Finally, trephining is occasionally required for the removal of necrosed bone, perhaps incarcerated by an overlapping ledge of the cranium. In a case of this kind, under my charge in 1842, the sequester was not only prevented from escaping, in consequence of the narrow state of the opening in the skull, but the irritation which its pressure exerted upon the brain and its membranes was such as to cause repeated attacks of epilepsy, which promptly and permanently disappeared upon the extrusion of the offending substance.

SECT. VIII.—CONTUSION OF THE BRAIN.

Contusion of the brain may be defined to be a sudden and violent attrition of a portion of its substance, attended with more or less laceration, and an effusion of blood, generally in the form of minute specks or little clots. It may present itself in two distinct varieties of form, the circumscribed and the diffused, the latter, which sometimes involves a large extent of tissue, being by far the less common. Resulting from the same causes as concussion of the brain, with which it is, in fact, almost constantly associated, the more serious cases are commonly the consequence of concentrated force, or of force applied with a pointed weapon. To produce it, however, there need not necessarily be a fracture of the skull, nor, indeed, any injury whatever of the calvaria; a fall upon the feet, knees, or nates is, at times, quite sufficient to give rise to it. Occasionally it follows apparently very slight blows upon the head. However this may be, the bruise is ordinarily direct, that is, at the part struck, although it may also be indirect, or at a considerable distance off, especially when it is caused by contre-coup. In the latter case, indeed, it is often immediately opposite the seat of the blow.

The most common situation of the lesion is the cerebrum, in its under part, owing, doubtless, to the intimate relation of this portion of the organ with the sharp edges of bone at the base of the skull. The cerebellum, pons, crura, and medulla are comparatively seldom affected.

The extent of the injury varies from a few small patches, so slight, perhaps, as to be hardly distinguishable, to the greater portion of an entire lobe, or even a large portion of one of the hemispheres. The most severe cases are usually connected with fracture of the cranium, with or without depression. Marked evidences of it almost invariably exist in fracture of the base of the skull, caused by blows or falls upon the vertex. Occasionally the lesion occurs at several points, more or less remote from each other, as the cerebrum, cerebellum, pons, and fornix, or the cerebrum, fornix, and medulla.

The contusion varies also in degree. In the circumscribed variety, the patches, in the milder cases, are confined exclusively to the gray substance, and are frequently not more than a few lines in diameter; they are of a dark-purplish hue, and are interspersed with minute specks of blood, not larger than pin-points, and more or less closely grouped, a section strongly resembling the appearances produced in capillary apoplexy. When the injury has been unusually violent, the discoloration is much deeper, as well as more uniform, and the affected part, torn, softened, and disorganized, is thoroughly infiltrated with blood, small clots of which, generally not exceeding the volume of a pea, are at the same time imbedded in its substance. Both the gray and white tissues are implicated, often to a great extent and in a high degree. The slight and severe forms frequently coexist in the same brain.

In the diffused variety of the lesion the extravasations are more or less widely disseminated; their size varies from that of the smallest pin-point to that of a millet-seed or a split pea, and they often exist in considerable numbers, though cases occur in which there are so few that, unless a very careful dissection is made, they may altogether elude detection. The cerebral substance around these clots is generally somewhat softened, and occasionally also a good deal discolored.

If death occurs soon after such an accident, the extravasated blood, whether appearing in the form of pin-point specks or in that of small clots, is usually found to be quite soft and of a dark color; after the lapse, however, of a few days, it is generally solid, and often a few shades lighter. At a still later period, it is partially, if not completely, absorbed, and replaced by a minute yellowish spot, containing, not infrequently, a little serous fluid, precisely as in ordinary apoplexy.

The membranes of the brain are variously affected. In the slighter forms of the injury, there may simply be an infiltrated, ecchymosed condition of the pia mater in the vicinity of the lesion, but in the more severe cases there is nearly always, in addition to this, more or less laceration of this membrane and of the arachnoid, with extravasation of blood into the sac of the latter, and occasionally also extensive detachment of the dura mater. Mr. Prescott Hewett, who has studied this subject with great care and attention, states that out of 69 cases of more or less severe contusion of the brain, independently of compound fracture, he found blood poured out in this situation in not less than 52, the quantity in 31 being so large as to cap the brain.

The *symptoms* of this affection are, in general, so vague and ill-defined that it is not surprising that its real nature should often be overlooked. Its recognition is the more difficult because it is nearly always accompanied with concussion, the symptoms of which, running into those of contusion, thus occasion an inextricable blending of the characteristics of the two lesions. Then, again, it is to be recollected that there must necessarily be many cases in which the affection is associated with, and masked by, compression of the brain, the result either of more or less copious extravasation of blood or of fracture of the skull with depression of bone. Hence, if an attempt be made to separate the more simple cases of contusion from the complicated, the number will be found to be exceedingly limited.

Dupuytren, who was the first to call attention to this lesion, came to the conclusion, in formulating the results of his experience, that the earliest reliable phenomena did not appear until about the fifth day, or the usual period for the supervention of cerebral inflammation. Observations, however, made since his time have led to a different result. In general, it may be inferred, especially in the absence of fracture, that the lesion is one of contusion, when, the first symptoms of shock having passed away, the disturbance of the brain more or less obstinately persists. This conclusion will be rendered so much the more probable when there is pretty complete loss of consciousness, along with an uncommon degree of somnolency, but no stertorous respiration; when there is extreme agitation and restlessness, the patient tossing continually about in bed; when there is rigid contraction of one or more of the limbs, especially of the fingers; and, finally, when there is more or less delirium during the first few days after the accident, with a gradual but steady aggravation of all the symptoms. In the milder cases of contusion there may be merely some contraction of one of the pupils, partial paralysis of an eyelid, impaired vision, indistinctness of articulation, slight spasmodic twitching of the muscles of the face, partial loss of memory, pain in the head, especially at the seat of the part struck, and defective sensation, or want of control over the action of the sphincters. When the lesion is complicated with fracture of the cranium, whether with or without depression, all effort at discrimination must be abortive. Finally, it must not be forgotten that, in the milder forms of contusion, the symptoms must necessarily be proportionately insignificant and evanescent, cerebral accommodation occurring within a short time after the accident.

The *prognosis* varies with the extent of the lesion, the presence or absence of complications, and the condition of the patient at the time of the accident. The milder cases will generally recover with little or no treatment, the effused blood being more or less rapidly absorbed, and the lacerated tissues gradually repaired. When, on the contrary, the contusion is very severe, the worst consequences are to be apprehended, death happening either soon after the infliction of the injury from structural disorganization, or secondarily from the effects of inflammation of the brain and its envelops.

The *treatment* must be regulated according to the general principles of practice applicable to other injuries of the brain and its membranes. The earlier symptoms are usually those of concussion or shock, and should, therefore, be combated by such means as are calculated to favor gradual reaction, as recumbency, access of cold air, the use of the smelling bottle, and the administration of ammonia, or, in the more severe cases, of some stronger stimulants. When this object has been accomplished, the chief duty of the attendant is to watch the patient that he may not, by overfeeding, neglect of his bowels, or premature exertion and exposure, bring on inflammation, the great source of danger after such an occurrence. The period when this may be looked for is, on an average, from the fourth to the sixth day; up to this period, therefore, as well as for some time after, his vigilance should rather increase than relax; every avenue should be guarded with the greatest care, and the slightest approaches of the enemy met with the most vigorous measures. The hard, frequent, quick, and jerking pulse, the intolerance of light and noise, the excessive restlessness and thirst, the suffused eye and flushed cheek, and the wandering intellect, with a tendency to coma, paralysis, and convulsions, are signs of evil import, which it is generally much easier to prevent than to control successfully after they have made their appearance. If the patient is plethoric, he must be freely bled at the arm or by leeches at the temples and behind the ears; the bowels moved by active cathartics; the head shaved, elevated, and cooled with pounded ice; in short, no effort must be spared to crush out the disease in its incipiency. The more remote effects of the lesion are combated by tonics and alterants, proper regulation of the diet and bowels, and change of air.

SECT. IX.—WOUNDS OF THE BRAIN AND ITS MEMBRANES.

Wounds of the brain and its membranes may be produced in various ways, or by whatever is capable of causing fracture of the skull. From the character of the weapon by which they are inflicted, they may be incised, punctured, lacerated, contused, or gunshot. They may occur without fracture, as when they are the result of contre-coup, but the most severe varieties of the injury are always associated with fracture and wound or laceration of the meninges of the organ. As stated under the head of concussion, this lesion is not infrequently complicated with laceration of the cerebral substance, exhibiting itself in the form of a rent or fissure, often several inches in length. Such an occurrence is by no means uncommon at the base of the brain from fracture by contre-coup, as happens when a person falls from a great height and alights upon the top of the head. A severe wound of the brain is sometimes caused by depressed bone, or by a spicule of bone driven down into the substance of the organ. Punctured wounds in the adult are generally confined to the anterior lobes of the brain, and are usually inflicted with narrow, sharp-pointed instruments, such as a fork, pen-knife, stick of wood, dirk, bayonet, and the like, thrust across the orbital plate of the frontal bone. Children, before the completion of the ossific process, may be injured in a similar manner through any portion of the skull. Some years ago a case was communicated to me of a punctured fracture of the skull, from a long nail penetrating deeply into the brain, in a lad six years old. The child, in falling from a considerable height, struck the top of his head against the nail, which was thus driven nearly two inches into the left hemisphere. In another case, which came under my own observation, in consultation with Dr. Rogers, a little boy fell, head foremost, upon the point of an iron fence rail, receiving a frightful wound upon the brain, and literally impaling himself. The cranial bones were extensively comminuted, and a large quantity of brain escaped during the removal of the loose fragments. Convulsions soon followed, and recurred, with more or less frequency and violence, up to the time of death, eighteen hours after the accident. The brain is sometimes traversed from one extremity to the other by a ball, bayonet, dirk, sword, or tamping-iron. Occasionally, again, the vulnerating body is retained in the organ. Thus, a ball, the butt-end of a pistol, pieces of iron, fragments of bone, and various other substances, have been found within the skull, in contact with the surface of the brain, or lodged more or less deeply in the cerebral substance. What is remarkable, in such cases, is that the extraneous matter does not always speedily cause death. A few instances are upon record of balls having become encysted in the brain, so as to be afterwards comparatively harmless. The usual tendency, however, of such bodies is to excite fatal inflammation.

But the most formidable wounds of the brain are generally those which accompany compound fractures of the skull and extensive laceration of the meninges. They are usually of a lacerated and contused nature, are apt to be followed by copious hemorrhage, and are frequently attended with pulpification and disintegration of the cerebral tissues, which sometimes escape in large quantity.

The *symptoms* and effects of wounds of the brain vary according to the extent of the lesion, and also according to the particular parts implicated. When the lesion is comparatively small, and the cerebral substance is not too much mashed or contused, recovery is altogether within the bounds of possibility, and may, under judicious management, take place even readily. The great danger to be apprehended, in all cases, is encephalitis, with the formation of fungus, or protrusion of a portion of the brain. The mind is not necessarily affected, and the patient often recovers without any untoward symptoms. When the accident is more severe, the danger will, of course, be greater; but even here it is wonderful what little disturbance sometimes follows in cases apparently the most desperate. We see occasionally large quantities of cerebral substance lost, and yet the patient make a most excellent recovery, his intellect being not only not weakened, but, perhaps, improved by the occurrence. Such cases are, of course, uncommon, and are chiefly interesting as serving to show the extraordinary resources of the system in surmounting the effects of some of the most frightful accidents that can befall a human being.

When the wound involves the base of the brain, or the superior portion of the spinal cord, life may be instantly destroyed by the stoppage of respiration. The intellectual faculties are also more deeply affected, if not completely annihilated, and ultimate recovery is doubtful in any case, however simple. If the patient is so fortunate as to escape with his life, he will afterwards suffer from loss of bodily and mental power; the mind will be permanently crippled, some of the special senses will be weakened, if not abolished, and the limbs will be affected with paralysis and contraction, followed sometimes by the most disgusting deformity. Epileptic convulsions are also of frequent occurrence.

Wounds of the cerebellum are often followed by priapism and other evidences of inordinate sexual excitement.

The *prognosis* of wounds of the brain and its membranes is altogether too variable to admit of general specification. While in some cases, indeed in a great many, the slightest injury causes death, in others, attended, perhaps, with excessive shock, and the loss of a large quantity of blood and cerebral matter, the most prompt and satisfactory recovery occurs. Thus, in a case treated by Dr. Ellerslie Wallace, the fracture, inflicted by a circular saw, was four inches and a quarter in length by one-sixth of an inch in width, extending horizontally across the skull, along the coronal suture, wounding the brain, and dividing the longitudinal sinus; and yet the patient, a girl ten years of age, rapidly recovered without one untoward symptom.

A still more extraordinary case happened in 1848, in the practice of Dr. J. W. Harlow, of Vermont; a case so unique that, if it were not well attested, its occurrence could hardly have been supposed to be possible. The accident took place while the man, who was twenty-eight years of age, was engaged in blasting rock, by the propulsion of a tamping iron, three feet seven inches in length by one inch and a quarter in diameter, and weighing upwards of thirteen pounds. The iron entered by its narrow extremity, near the angle of the lower jaw, on the left side, passing obliquely upwards behind and below the zygomatic arch, traversing the skull, the anterior lobe of the cerebrum, and the longitudinal sinus, and fracturing, as was supposed, the malar, sphenoid, temporal, and frontal bones, at the latter of which it emerged, just in advance of the coronal suture. Notwithstanding this horrible mutilation, the patient made an excellent recovery without any impairment of his mental and physical faculties, except the loss of the left eye. When last heard from, twelve years after the receipt of the injury, he was perfectly well.

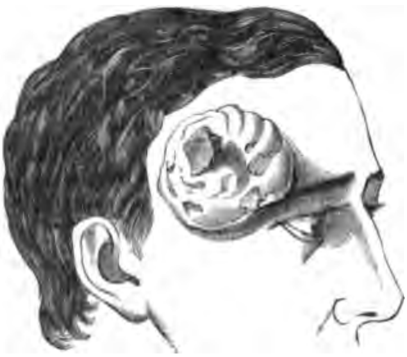
The *treatment* of wounds of the brain and its envelops must be conducted upon the most rigid antiphlogistic principles; great care, however, must be taken not to carry this plan too far, for it should be recollected that a certain amount of inflammation is absolutely necessary to insure the restoration of the injured structures. If, therefore, the depletion is pushed to an inordinate extent, the system may be so far exhausted by it as to be unable to furnish the parts with the requisite supply of blood and plasma to carry on the work of repair. Besides, it can hardly be doubted that very active measures, tending to add still further to the debility of the patient, can fail to prove prejudicial, by abstracting unduly the nervous influence of the brain, and thereby seriously retarding, if not altogether preventing, recovery. On the other hand, too much forbearance must be equally disadvantageous. Hence, he will best discharge his duty who steers a strictly middle course, neither giving too much freedom to his hands, nor exhibiting too much inactivity. Having removed all extraneous substances, and placed the parts, provided they are accessible, as nearly as possible in their natural relations, the patient is carefully watched, any tendency to over-action being at once arrested by the lancet, leeches, and other means. Early recourse is had, in all cases, to active purgation, the best articles for the purpose being calomel and jalap, or infusion of senna and sulphate of magnesia. When the patient has difficulty in swallowing, stimulating enemas must take the place of cathartics. Vomiting must, of course, be carefully guarded against, but when there is great dryness of skin, conjoined with an active pulse and excessive restlessness, there is no remedy more likely to promote perspiration, subdue vascular excitement, and tranquillize the system, than tartar emetic in union with morphia. I am never afraid to employ either of these articles in wounds of the brain, after the system has been properly reduced by bleeding and purgatives, or when these means are rendered unnecessary in consequence of previous shock and loss of blood. The head, well shaved, is thoroughly elevated, and kept constantly covered with a bladder partially filled with pounded ice. Starvation is not carried too far, lest it should create irritability in the heart and brain; at the same time great care is taken that the diet is perfectly simple and non-stimulant. All excitement is avoided, both during the active treatment and for a long time afterwards

Great prejudice has generally existed against the exhibition of anodynes in wounds of the brain and its envelops. Early in the disease they are, no doubt, usually injurious, but after due depletion has been practised, or when marked exhaustion has been induced by shock, loss of blood, or other causes, they not only prove eminently useful, but are absolutely indispensable to quiet the system and place the affected structures in a suitable condition for reparation. Their effects should, of course, be sedulously watched, and, in most, cases, they may be advantageously combined with some diaphoretic, as ipecacuanha, tartar emetic, or the neutral mixture.

SECT. X.—FUNGUS OF THE BRAIN.

This affection, sometimes, ridiculously enough, called hernia of the brain, consists in a protrusion of cerebral substance through an opening in the skull, accompanied by a laceration of the brain and its envelops. It occasionally follows caries of the cranial bones and disease of the dura mater. One of the worst cases that I have ever seen was produced by syphilitic ulceration of the skull. When it supervenes upon external violence, it generally makes its appearance within a few days after the accident, and sometimes, indeed, almost immediately, especially when the cerebral lesion is unusually extensive. Its progress is commonly very rapid, the growth often attaining the size of a hen's egg in less than a week. Pressure has a tendency to restrain it, and to limit its bulk. The form of the tumor bears a considerable resemblance to that of a mushroom, the expanded portion overhanging the skull, while the narrow, projecting through the abnormal opening, is connected with the brain below. Its surface is rough, incrusted with lymph, and bathed with ichorous matter; in some cases it is studded with fungous granulations. The appearances of cerebral fungus are well illustrated in fig. 85, from one of my patients. The fracture was situated at the outer and inferior portion of the frontal bone.

Fig. 85.



Fungus of the brain after fracture.

If a section is made of the fungus, it will be found to be composed of a mixture of cerebral substance and plastic matter, sometimes the one, sometimes the other predominating. When the growth is recent and rapid, it is not unusual for it to contain small masses of clotted blood, similar to apoplectic depôts of the brain. Its structure is usually very vascular, and it, therefore, often bleeds quite freely when cut, or even when roughly handled. Destitute of sensibility, it is elastic and compressible, moving synchronously with the pulsations of the brain. That this tumor is not composed entirely, or even in great measure, of cerebral matter, as has sometimes been supposed, is proved by the circumstance that, after death, the loss of brain does not at all correspond with the volume of the morbid growth and the repeated retrenchments to which it was subjected during life. If this were the case, we should often find the greater portion of one entire lobe destroyed, or, at all events, an immense cavern in the affected hemispheres; but such, except in a few rare instances, is not the fact. The cerebral tissues around the tumor are always softened, discolored, and more or less infiltrated with serosity.

It is impossible to confound this morbid growth with any other; its history, the rapidity of its development, and the peculiarity of its shape, being always sufficient to mark its character. The symptoms which accompany it are variable. The discharge is usually of a thin, ichorous nature, quite profuse, and excessively fetid. Frequent bleeding occurs. The mind is sometimes affected from the very first; at other times it remains perfectly clear and calm for days and weeks. In general, however, there is considerable cerebral disturbance, as indicated by the delirium and by the incoherent answers of the patient; the countenance has a peculiarly vacant expression; the skin is dry and harsh; the pulse, seldom normal, is either too frequent, or, as more commonly happens, too slow; the secretions are deranged; the bowels are constipated; and the sleep is interrupted by frequent starts and twitches. As the disease nears its close, coma and convulsions set in, and the patient dies, gradually exhausted, from nervous irritation. Recovery is an extremely rare occurrence in any case, however simple.

In the early stage of this affection, before the tumor has made much progress at extrusion, well conducted systematic compression constitutes the prominent feature of the *treatment*. The object is to restrain the growth, and to circumscribe its limits. The pressure is made with a piece of sheet lead, a compress, and a roller, changed as often as may be necessary to insure firmness and cleanliness. As the mass recedes, the compress is gradually pushed into the osseous opening, until it is reduced to the level of the brain. To prevent relapse, the pressure is steadily maintained, now, of course, more gently, up to the very point of cicatrization. When, through neglect or mismanagement, the protrusion has attained considerable bulk, the proper plan is to excise all that is accessible, or to destroy it with the Vienna paste, or, what I prefer, the actual cautery, the parts being afterwards protected in the manner just indicated. When the discharge is very offensive, free use must be made of the chlorides. The patient's strength should be supported by tonics and a mild but nutritious diet. The head must be maintained in an elevated position, and all excitement carefully avoided. Sometimes the fungous mass, becoming strangulated by the edge of the orifice in the skull, loses its vitality, and sloughs off; rarely, however, with any permanent advantage.

SECT. XI.—GUNSHOT INJURIES OF THE HEAD.

Gunshot injuries of the head constitute an important class of lesions, often difficult of diagnosis, and liable, even when comparatively slight, to be followed by the most serious consequences. They may be limited exclusively to the scalp, merely grazing, bruising, or dividing its substance; or they may involve the cranial bones; or, finally, they may embrace all these structures, along with the brain and its envelops.

1. *Gunshot Injuries of the Scalp.*—These lesions derive their chief importance from their proximity to the brain and their consequent liability to give rise to cerebritis and arachnitis. Erysipelas is also a common occurrence, and occasionally they are followed by jaundice, with or without abscess of the liver. When the missile penetrates the pericranium, or contuses the skull, the accident may cause suppuration and slight exfoliation of the outer table of the bones. The prognosis after such injuries should, therefore, always be very guarded, the more so when it is recollected that they are not infrequently accompanied with serious mischief to the brain and its envelops.

The modern military surgeon meets no longer with any of those curious cases of the circuitous route pursued by balls in gunshot injuries of the scalp, so much spoken of by European writers in the early part of the present century, during the reign of the round missile. The conical bullet performs its work much more neatly, rarely glancing, or deviating from the straight line.

The *treatment* of these lesions is similar to that of gunshot injuries in general. If the ball has lodged, immediate extraction is effected, any foreign matter that may have entered along with it being removed at the same time. Such wounds, which cannot be watched with too much solicitude, often require dilatation and counter-opening, to afford vent to effused fluids.

2. *Gunshot Injuries of the Skull.*—These injuries may be divided into three classes:—1st, contusions and fractures of the bones without depression; 2dly, fractures with depression; 3dly, fractures with perforation of the brain and its envelops.

a. Contusions and Fractures without Depression.—Grave injury is often inflicted upon the skull by the blow of a ball or shell, the osseous tissues being violently bruised and shaken, but not broken. Such a lesion is generally fraught with danger from the fact that it is nearly always attended with serious disorder of the brain, as concussion, contusion, or laceration, eventuating, if the case is at all severe, or improperly managed, in destructive inflammation. The danger here, however, is not merely in the first instance; the patient may happily survive the primary effects of the accident, but perish from the secondary, death happening, perhaps, weeks, if not months, after the receipt of the blow. Even under the most favorable cirumstances, recovery will be tedious and troublesome, if for no other reason than the fact that abscesses under the scalp will be apt to be repeated, with more or less extensive exfoliation of the contused bones.

Sometimes a ball or shell, in traversing the skull, scoops out a portion of its substance, leaving thus a pretty deep furrow, groove, or gutter, perhaps several inches in length; or the missile strikes the bone, and breaks it, not unlikely at several points, causing a fissured, stellated, or even a comminuted fracture, without depression. Occasionally, though rarely, a shell carries away bodily a considerable portion of the skull-cap, along with the corresponding portion of scalp. The danger of all such injuries is too apparent to require comment.

The *treatment* of these various lesions must be strictly antiphlogistic, blood being taken freely by leeches, or even by the lancet, if the patient is at all plethoric, and the danger from cerebral involvement imminent; the bowels are thoroughly moved by drastic cathartics; the heart's action is controlled by the antimonial and saline mixture with the addition of a suitable quantity of tincture of veratrum viride; and the head, shaved and elevated, is kept constantly covered with pounded ice, or some refrigerant lotion. If the case is obstinate, mercury is employed, in doses from two to three grains thrice a day, with a view to rapid and decided ptyalism.

b. Fractures with Depression.—Gunshot fractures of the skull with depression of the bone are among the most common and fatal injuries on the field of battle. The bone may be broken without a wound in the scalp, the latter being, perhaps, merely somewhat contused, as when the blow is inflicted by a shell or a partially spent round shot; but, in general, there is also an opening in the soft parts, the case thus constituting one of compound fracture. The bone, moreover, may be comminuted, or shattered into numerous fragments. The skull is sometimes frightfully broken, and yet the scalp remains literally intact. A case of this kind, referred to by Dr. Macleod, occurred at the battle of the Alma. A round shot, passing in ricochet, struck the scale from an officer's shoulder, and merely grazed his head as it ascended. The result was instant death. The skull was so completely mashed that the fragments rattled under the scalp like so many marbles in a bag. The brain was not examined.

The amount of depression in this form of fracture is variable, depending upon the size and force of the missile and the brittleness and thickness of the skull. Occasionally it is extremely slight, but examples occur in which it is of frightful extent, involving the greater portion of the posterior vault of the skull, the vertex, or the frontal bone. In rare cases it is limited to the outer or inner table; probably more frequently to the latter than the former. The possibility of such a fracture was at one time universally rejected, but that it may take place has been satisfactorily shown by modern military surgeons.

There are certain rules which, in the *treatment* of fractures of the skull with depression, are applicable to all cases of the injury, whatever may be its extent. These are, first, to remove foreign matter, so as to place the parts in the best condition for satisfactory reunion, and, secondly, to guard against the supervention of undue inflammation. The disposition of the missile varies. It seldom lodges, but rebounds, and is lost. When it is arrested, it will generally be found to be much flattened, and very irregular, and to be either imbedded in the bone, or intercepted in a crevice of the fracture. Sometimes it is cut in two, one portion being lost, while the other either lies under the scalp or has entered the brain. However this may be, it must, if found, be promptly extracted, along with any fragments of bone that may be very loose, or completely detached. In regard to the depressed bone itself it should undoubtedly be elevated, if this can be done without inflicting serious injury upon the brain and its envelops. To leave it in its unnatural position would be productive only of future mischief. In making this remark, I certainly do not wish to be understood as advocating interference in every case of depressed fracture. When the accident is very slight, and, especially, when it is unaccompanied by a wound of the scalp, the best plan is to let the parts alone, the surgeon restricting himself to the employment of such means as may tend to favor rapid and permanent cerebral accommodation. But there are cases in which the propriety of trephining is so self-evident as not to admit of the slightest hesitation. Such cases fall under the same rules as similar injuries in civil practice. If the depressed bone, perhaps terribly shattered, and, to a considerable extent, even thrust into the brain, is not promptly removed, it must either cause fatal inflammation, or, if recovery should occur, eventually lead to epilepsy and other distressing affections, rendering life hardly worth the possession.

There seems to be a growing disposition on the part of practitioners to eschew the use of the trephine nearly, if not entirely, in depressed fractures of the skull. Thus, Dr. Stromeyer, surgeon-in-chief in the Schleswig-Holstein war, pointedly condemns the operation in every case, on the ground that, independently of the mischief inflicted upon the tissues during its performance, the admission of air to the contused portion of the brain and its membranes greatly augments the danger of inflammation. Of 41 cases of gunshot fractures of the skull with depression, reported by him, 7 died, and 34 recovered. Among the latter was one which had been trephined, and this was the only instance of the kind throughout the war which gave a favorable issue.

Observations made in the Crimean war strongly corroborate the views of Dr. Stromeyer. The English surgeons applied the trephine successfully only in four cases, and in those not on account of rifle-ball wounds, during the entire campaign; and the operation does not seem to have been any more favorable in the French army, Dr. Scrive asserting that it was for the most part fatal. Dr. Macleod concludes, from the result of his experience, that interference is only admissible when the bone is very deeply depressed on the brain, and the patient is comatose, with stertorous breathing, a slow pulse, and a dilated pupil. In all other cases, in which these phenomena are not very decidedly marked, or where they do not continue for any considerable length of time, trephining should, he thinks, be avoided.

The above views, although emanating from men of large experience, should, I think, be received with great caution when applied as rules of practice. Every surgeon knows that there are certain lesions of the skull which must necessarily be fatal under any mode of treatment, however judiciously conducted, and the very fact that the use of the trephine is required, is of itself an evidence that the case will be one of doubtful issue, not merely as a consequence of the injury inflicted upon the parts during the operation, or, as Larrey and Stromeyer suppose, of the admission of air, but from the intrinsic mischief done to the brain and its membranes by the primary blow. As a proof of the great mortality of such lesions, it may be stated that, in the Crimean war, they invariably ended fatally whenever they were at all severe. Of 76 cases of depressed fractures unattended with penetration or perforation, 55 perished, 12 were invalided, and 9 only were discharged as fit for duty. In the 21 who survived, the amount of depression was very slight, and all these, excepting one, recovered without a bad symptom. Of 86 cases, in which the skull was perforated, not one was saved.

Moreover, it must be remembered that there is a great difference between gunshot lesions of the skull as inflicted with the conical and the round ball, the former making, as a general rule, an incomparably worse wound than the latter. In former times, men injured with the round ball often made excellent recoveries, with hardly any treatment at all, or perhaps even after the most severe exposure and fatigue, evidently because, although the cranium was apparently badly hurt, the brain and its membranes had sustained little or no injury. Thus, after the battle of Talavera, of fourteen men with wounds in the head, involving the skull, not one died, notwithstanding they were compelled to march for sixteen consecutive days under the influence of a burning sun, with no other treatment than simple water-dressing. In several of these cases both tables of the skull were broken, and in two fracture of the frontal bone coexisted with destruction of the globe of one eye. Now, no one will presume to assert that these men would have fared so well if they had been wounded with the sharp and heavy Minié ball, instead of the old round ball, used in the Peninsular war.

Finally, in compression of the brain from blood or pus, consequent upon gunshot injuries, the same rules of practice are to be pursued as in ordinary cases. The great difficulty here will be, not in performing the operation, but in knowing when it is necessary. In general, the formation of matter, under such circumstances, does not occur under several weeks.

c. Fractures with Perforation of the Brain.—These injuries are nearly always promptly fatal, the patient dying either on the spot from shock and hemorrhage, or, at all events, within the first eight days, from the effects of inflammation. The danger in these cases is not from the ball alone, although this is generally very great, but also from the presence of pieces of bone, hair, and other extraneous matter which are forced in with it, and which are often much more destructive than the missile itself, contusing, tearing and pulpifying the cerebral tissues in the most frightful manner. A ball, lodged in the brain, is sometimes encysted, and may then become a comparatively harmless tenant, the functions of the mind and body being performed with their accustomed vigor; in general, however, it acts as an irritant, even when it is thus isolated, exciting inflammation, which is certain to be followed by abscess and death. Bone and other foreign matter are never encysted; the lymph effused around them is incapable of organization, and the consequence is that they soon produce fatal disturbance.

Although gunshot wounds of the skull and brain nearly always prove fatal, yet a remarkable exception occasionally occurs, the patient getting well, as it were, despite the injury, and in defiance of all the laws of prognosis. This was happily exemplified in the case of a youth, aged eighteen, the particulars of which have been kindly communicated to me by Professor May, of Washington. The ball, an ounce one, entered the upper and back part of the skull, making an opening capable of receiving the index finger, and penetrating the brain, as was proved by the fact that some of it had escaped at the wound. Where the ball lodged could not be ascertained. Rapid and complete recovery followed without a solitary untoward symptom.

The *treatment* of these accidents resolves itself into the removal of foreign matter, the elevation of depressed bone, and an effort to sustain the brain in its attempts at repair. The finger is, of course, the best probe, but all officious interference is to be avoided, inasmuch as it is far better to let the missile and even detached pieces of bone remain where they are than to search for them at the risk of severe additional injury. A counter-opening with the trephine, with a view of facilitating the extraction of the ball, is hardly to be thought of in any case, although two instances have been recorded, one by Larrey and the other by Charles Bell, in which such a procedure was followed by the most happy result.

The antiphlogistic measures must be strictly gauged by the exigencies of each particular case; depletion must not be carried to excess; if the shock and loss of blood have been great, stimulants and even anodynes may be required from the start, to support the system and quiet the heart's action. Fungus, so apt to arise during the progress of the treatment, should be repressed in the usual manner.

Foreign bodies, of considerable weight and bulk, occasionally remain in the substance of the brain for a great length of time, without provoking serious disease, the patient, perhaps, in the meanwhile enjoying very good health, both of mind and body. Langlet met with a case in which a large ball was retained in this organ for eighteen months, before it excited fatal inflammation, and a still more remarkable instance has been recorded by Anel. In this case, the man remained well for many years, and the ball, after death, was found lying upon the pineal gland. Dr. O'Callaghan has reported the case of an officer who lived for seven years with the breech of a fowling-piece, weighing three ounces, in the forehead; and a number of examples of a similar kind have been recorded by other observers.

But, although a foreign substance may thus occasionally remain for a time as a harmless tenant in the brain, it is sure, sooner or later, to excite inflammation, eventuating in destructive softening and suppuration. In the remarkable case of Anel, above referred to, the wounded man lived for many years without apparently any inconvenience from the ball, but at last died very suddenly, while playing cards. The missile was deeply lodged in the brain, surrounded by recently effused blood.

Gunshot Injuries of the Orbitar Plate of the Frontal Bone.—Experience has shown that a ball, entering the orbit, and passing directly backwards and upwards, generally destroys life by the violence which it inflicts upon the brain and its envelops, the patient dying either on the spot from shock and hemorrhage, or within a few days after the accident from the inflammation. If, on the contrary, it pursues a downward course, the brain may entirely escape, or suffer merely in a slight degree.

The eye is often seriously implicated in gunshot injuries in this situation; in some instances it is totally annihilated, while in others it is so severely wounded as to be destroyed by the resulting inflammation. Occasionally the globe of the organ escapes, but the optic nerve is cut off, the lesion being followed by immediate and permanent blindness.

It is well known that the orbitar plate may be severely shattered, and yet, if the case is properly treated, the pieces may ultimately perfectly reunite; for such is the abundant supply of vessels and nerves of the soft parts of the face and eye that they impart to this portion of the skeleton a much greater conservative power than is possessed by the osseous system in general.

A ball sometimes passes across the skull from one temple to the other, without inflicting any serious injury upon the brain or other soft parts, the patient ultimately making a good recovery. Such an occurrence, however, is much less common now than formerly, during the use of the round ball. After the battle of Waterloo a number of cases of this kind were treated successfully by the British surgeons.

Sword and Sabre Cuts of the Head.—Fractures of the skull inflicted by the sword, sabre, or Indian arrow, are generally of a very grave character, usually proving fatal, either from shock, hemorrhage, or inflammation. A sharp arrow, as I am informed by Dr. T. C. Henry, of the army, will cut a hole into the skull, owing to the great force and velocity with which it is propelled, without apparently any fracture whatever, producing a kind of incised wound, which, however, is very liable to be followed by death. A portion of the outer table of the skull, or even of its entire thickness, is sometimes sliced off by a sabre or sword, hanging, perhaps, merely by a narrow flap of scalp. When this is the case, the parts should immediately be replaced, and secured by suture, in the hope of their speedy reunion.

Wounds of this kind, apparently of the most desperate character, are sometimes happily recovered from. A case related by Ambrose Paré admirably illustrates the truth of this remark. "A party," says he, "had gone out to attack a church where the peasants of the country had fortified themselves, hoping to get some booty of provisions; but they came back very soundly beaten, and one, especially, a captain-lieutenant of the company of the Duke de Rohan, returned with seven gashes on his head, the least of which penetrated through both tables of the skull, besides four sabre wounds in the arm, and one across the shoulder, which divided one-half of the shoulder blade. When he was brought to the quarters, his master, the duke, judged him to be so desperately wounded that he absolutely proposed, as they were to march by daylight, to dig a ditch for him, and throw him into it, saying that it was as well that the peasants should finish him. But being moved with pity, I told him," says Paré, "that the captain might get cured. Many gentlemen of the company joined with me in begging that he might be allowed to go along with the baggage, since I was willing to dress and cure him. This was accordingly granted. I dressed him, and put him into a small, well-covered bed, in a cart drawn by one horse. I was at once physician, surgeon, apothecary, and cook to him, and, thank God, I did cure him to the admiration of all the troops, and out of the first booty the men-at-arms gave me a crown apiece, and the archers half a crown each."

SECT. XII.—INJURIES OF THE CEREBRAL NERVES.

Fractures of the skull are not infrequently attended by serious lesion of the cerebral nerves, which, in their passage through the different openings at the base of the cranium, are liable to be contused, lacerated, and even completely cut asunder by the sharp edges of the osseous fragments, or by the vulnerating body, as in gunshot and other injuries. The nerves most prone to suffer in this manner are the auditory and facial as they lie in the internal auditory meatus. Sometimes the mischief is induced by the compression experienced by some of these cords from displaced bone or extravasated blood, whether externally to them or within their neurilemma. Occasionally, again, the injury is manifestly dependent upon mere concussion of the nerve-pulp.

The symptoms attendant upon these lesions vary according to the nature of the affected nerve, as to whether it is one of motion, sensation, or respiration. When a nerve of motion suffers there must necessarily be paralysis of the parts supplied by it, the deprivation of function being either partial or complete, according to the extent of the injury. In fracture of the base of the skull, palsy of one side of the face is a frequent phenomenon, noticed from the earliest periods of the profession. Paralysis of the upper eyelid, technically called ptosis, may be caused by injury of the third pair of nerves, more generally by pressure from extravasated blood than by contusion or laceration, both of which are very uncommon here. In some of the recorded cases of this affection, the ptosis was associated with dilatation of the corresponding pupil and paralysis of other parts of the body. The fourth pair of nerves, owing to their protected situation, enjoy a remarkable immunity from injury in fracture of the base of the cranium. When the fifth pair is wounded or compressed, the most important symptom is loss of sensibility of the face, accompanied, in severe cases, by a similar condition of the tongue and nose. When the sixth cerebral nerve is compressed or lacerated, convergent strabismus is liable to follow, from paralysis of the internal straight muscle of the eye. Loss of hearing, sight, and smell ensues upon injury of the auditory, optic, and olfactory nerves. It is worthy of note that facial paralysis may exist without deafness, and conversely. Injury of the pneumogastric, glosso-pharyngeal, hypoglossal, and spinal accessory nerves is attended with dyspnœa, aphonia, dysphagia, and torpor of the stomach.

Some of these affections subside spontaneously or under the influence of appropriate medication; others, however, remain permanently, despite our treatment. When there is reason to believe that the cause of the trouble is compression from extravasation of blood, a mild course of mercury with iodide of potassium, and steady but gentle purgation, might be useful; but, under opposite circumstances, the case is generally hopeless.

SECT. XIII.—CHRONIC HYDROCEPHALUS AND TAPPING OF THE SKULL.

The surgeon is occasionally called upon to give his opinion respecting the treatment of chronic accumulations of water in the head, technically denominated hydrocephalus, or dropsy of the brain. The disease is fortunately a rare one, for it is nearly always fatal, whatever mode of management may be adopted for its relief. In regard to its pathology, there has been much diversity of opinion; my own belief, founded upon a careful observation of a considerable number of cases, is that the disease essentially consists in subacute, or chronic arachnitis, commencing generally some time before birth, and going on gradually increasing until the head attains an enormous volume, causing hideous deformity. It would, perhaps, be wrong altogether to deny that the affection may occasionally commence after birth, but if such an event does happen, it must be very uncommon; for, even when a child thus affected is apparently healthy when ushered into the world, well marked signs of the disease usually manifest themselves so soon afterwards as to lead to the conviction that its origin was laid during intra-uterine life, probably in some inscrutable vice of the constitution.

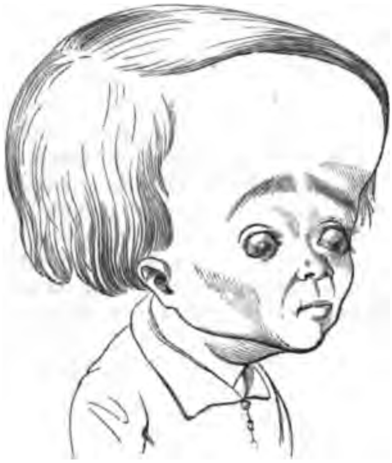
The *fluid*, which consists almost wholly of water, with some of the earthy salts, but hardly any albumen, usually occupies the ventricles of the brain, which, as the accumulation augments, becomes at length completely unfolded, forming a layer perhaps not more than from three to six lines in thickness, in which it is difficult, if not impossible, to distinguish any white and gray substance. In some instances, it is situated in the arachnoid sac, on the surface of the brain, and when this is the case, the organ, in consequence of the severe and long-continued pressure of the water, is generally very much atrophied and distorted. I have not met with any examples in which the fluid was lodged between the cranium and the dura mater, and doubt very much whether it ever occurs here. Indeed, how could it get here, if we assume, as we certainly must, that the water is furnished by the arachnoid membrane? The dura mater has no such power, any more than any other fibrous tissue.

The quantity of water varies from a few ounces to several quarts. Cases have been reported in which upwards of fifty ounces were drawn off in one operation during life, and more than twice that amount has occasionally been found on dissection.

The disease is always *chronic*, and, if permitted to proceed, often continues for a number of years before it proves fatal. The general health, however, usually begins to suffer at an early period; the child becomes thin and emaciated, loses control over its muscles, and requires to be fed, although the appetite may be quite voracious. Convulsive twitchings are of common occurrence, the eyes roll constantly about in their sockets, the pupils are dilated, speech is absent, and the urine and feces commonly flow off involuntarily. The head, in the more advanced stages of the disease, is sadly misshapen, and altogether too heavy for the weakened body. The fontanels are wide open, the cranial bones are abnormally thin and expanded, almost like parchment, and the subcutaneous veins of the scalp are enormously enlarged. In general, the mind is idiotic, and existence purely vegetative. The peculiar appearances of the head in hydrocephalus are well seen in fig. 86, from one of my clinical cases. Fig. 87 exhibits the state of the bones and fontanels, divested of their soft parts.

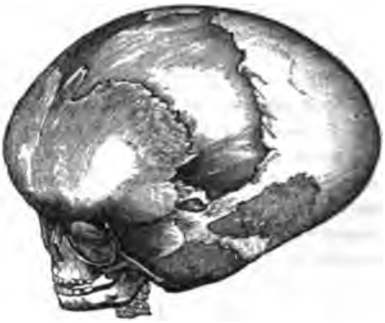
The *treatment* of this disease could not possibly be more discouraging. A cure, it is true, occasionally occurs, sometimes spontaneously, as after a violent attack of diarrhœa, or a course of active purgation, but the event is so uncommon as only to prove the exception to the great law which, at no distant period, inevitably consigns the patient to his grave. In such a work as this, it is not worth while to give even an outline of the leading plans of treatment that have been proposed for the relief of this affection, inasmuch as there is not a solitary one deserving of the slightest confidence. In the milder cases, especially in

Fig. 86.



Chronic hydrocephalus.

Fig. 87.

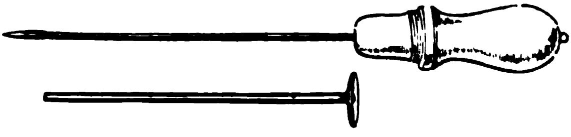


Skull of a hydrocephalic child.

their earlier stages, benefit may sometimes be derived from the steady use of sorbefacient applications to the head, as iodinized unguents or lotions, and the exhibition of iodide of potassium and bichloride of mercury, aided by an occasional laxative, and a properly regulated diet. Shaving the scalp, and afterwards vesicating it with cantharides, has sometimes seemed to prove useful No advantage could reasonably be expected from counter-irritation by a seton, or by an issue in the nape of the neck. Regular, systematic compression has repeatedly been tried, either with adhesive strips, or the roller, or both together, and a few cases have been reported of its supposed efficacy Usually, however, the cure is only temporary, and it is proper to add that the treatment is often followed by convulsions, thus necessitating its abandonment

Puncture of the cranium, first proposed in 1817, by Dr. James Vose, of Liverpool, has often been practised, and, if we were to credit the statements that have been published upon the subject, we could hardly fail to award to it the praise of extraordinary merit. Thus, one physician, Dr Conquest, asserts that he has cured not less than ten cases out of nineteen. Dr. West has collected sixty-three cases in which the head was tapped by different surgeons, of which eighteen, or two out of seven, are said to have terminated successfully. I must confess, however, my disbelief in all these statistics, convinced that they are unreliable, not because of any wilful misrepresentation on the part of the reporters of these cases, but simply because they either deceived themselves, or allowed themselves to be deceived by others. I have myself never heard of a radical cure effected in this way. In the only two cases in which I have performed the operation, death in each ensued in less than four days from convulsions; and such must, I am satisfied, generally be the result, especially when the accumulation is at all considerable, however carefully the treatment may be conducted after the evacuation of the fluid. It requires no argument to show that life cannot be long supported when such an amount of pressure as attends confirmed dropsy of the brain, is suddenly taken off from so important an organ.

Fig. 88.



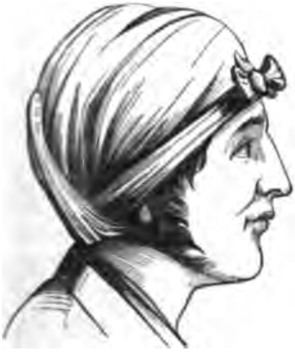
Trocar for puncture of the cranium.

The puncture is made with a very delicate trocar, fig. 88, introduced some distance from the longitudinal sinus, and closed as soon as about two-thirds of the water have been evacuated, with collodion and adhesive plaster, which should be extensively applied with a view of compressing the skull. The operation may be repeated once a week.

SECT. XIV.—BANDAGES FOR THE HEAD.

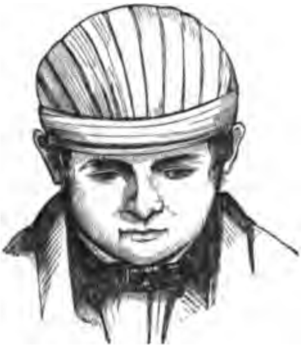
For simply retaining dressings, cataplasms, and lotions upon the head, the best contrivance generally is a light handkerchief, arranged in the form of a nightcap, or a nightcap itself. The handkerchief being folded into a triangle, the centre of the base is applied to the forehead, and the body to the vertex, the tail hanging back over the neck. The side ends, lying upon the cheeks, are then carried backwards over the ears, crossed at the occiput and tied in front, an inch above the nose, as represented in fig. 89. When greater nicety is required, as when the object is to make moderate, but equable compression, a double-headed roller should be used, after the fashion shown in fig. 90. Its application is thus described by Mr. Lonsdale. "The centre of the roller is placed low down on the forehead, and the two heads are carried back and made to cross low down beneath

Fig. 89.



Handkerchief bandage.

Fig. 90.



Recurrent bandage.

Fig. 91.

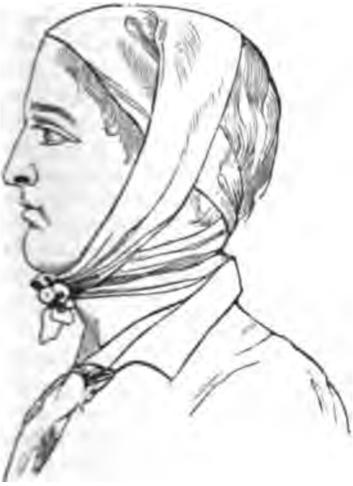
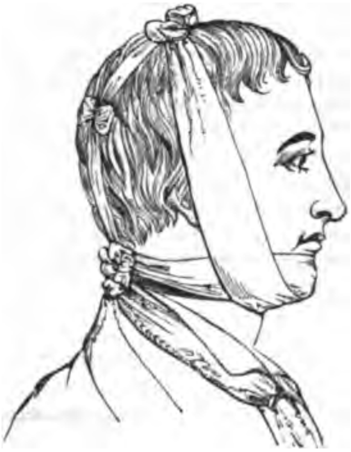


Fig. 92.



Four-tailed bandage for the head.

the occiput. One head is brought over the vertex, while the other is carried horizontally round to lap its extremity; and this, turned up over the horizontal one, is carried back to the occiput, slightly overlapping the former vertical band. At the occiput, the heads are again crossed, the surgeon shifting his hands for the purpose, and a third turn is made on the other side of the vertical band, while a third horizontal round secures it as before. This is continued until the whole head has been uniformly invested."

The four-tailed bandage also answers a very useful purpose, especially for retaining dressings. Its application is shown in figs. 91 and 92. It consists of a piece of soft muslin, linen or calico, of the requisite length, split up nearly to the centre, in such a manner as to form four strips, the anterior of which are carried back and tied under the occiput, while the posterior are fastened under the chin. In some cases the position of the tail is reversed, according as the middle portion of the bandage rests on the forehead, chin, or occiput.

CHAPTER III.

DISEASES AND INJURIES OF THE SPINAL CORD, VERTEBRÆ, AND BACK.

The most important surgical affections of the spinal cord are concussion, compression, sprains, inflammation, and wounds. The vertebræ are subject to curvature, tuberculosis, and congenital clefts, attended with protrusion of the arachnoid membrane, and constituting what is called hydrorachitis.

CONCUSSION.

Concussion of the cord is produced by accidents similar to those which occasion concussion of the brain, as blows or falls upon the back, head, feet, or nates. The severity of the effect is usually in proportion to the directness of the injury; but the most violent and protracted case of concussion of the spine I have ever seen was caused by a fall, in an elderly gentleman, upon the buttocks, from a height of about ten feet, down upon the floor. The affection exists in various degrees, and probably does not always affect the entire cord, being limited to particular tracts of it, or concentrated with special force at particular points. However this may be, the symptoms are commonly quite characteristic. The patient feels sick at the stomach, looks excessively pale, and is altogether helpless, his body being more or less paralyzed. A sense of formication, stinging, or prickling, is experienced along the spine and in the extremities; the sphincters are relaxed, and, in the more severe cases, there are apt to be involuntary discharges from the bladder and bowels. Death may occur from the severity of the injury within a short time after its infliction; or, reaction taking place, the effects of the concussion may gradually pass off, the limbs regaining their functions and the sphincters their power of action. In some cases, however, the mind remains bewildered for a number of days, the patient being partially delirious, but yet not sufficiently so to prevent him from washing and shaving himself, or even, perhaps, attending to business. Another remarkable symptom, which I have occasionally witnessed, after recovery from the more immediate effects of the injury, is excessive irritability of the bladder, attended with an almost incessant desire to pass water, which is generally greatly increased in quantity.

The *treatment* of concussion of the spinal cord must be conducted upon the same general principles as that of concussion of the brain; by recumbency and cordials, or mild stimulants, during the stage of depression, and by great vigilance during the period of reaction, lest it should transcend the healthy limits and pass into inflammation. Should this untoward circumstance arise, it must be promptly met by the usual antiphlogistic means. A full anodyne, with the addition of a little tartrate of antimony and potassa, will generally speedily arrest the irritability of the bladder and the tendency to inordinate renal secretion.

Various *secondary effects* are liable to occur after concussion of the spine, as neuralgia of different parts of the body, partial or complete paralysis, muscular twitches, defective speech, atrophy of certain muscles, arrest of development, imperfect sexual power, and a want of control over the sphincter muscles of the anus and bladder. Occasionally the patient is permanently affected with retention or incontinence of urine. The treatment for the relief of these affections must be conducted upon the same general principles as in concussion of the brain.

SPRAINS.

The spine is composed of a series of joints, which, from the peculiar mode of their connection, admit of comparatively little motion, except in the cervical and lumbar regions. The ligaments are, for the most part, very short and strong, and the column, as a whole, is still further strengthened by the large muscles and firm aponeuroses which cover them in at the sides behind. Owing to these circumstances, it is impossible for a sprain to occur here without the application of great force, either directly to the part itself or indirectly through some neighboring part, as when a person falls from a considerable height and alights upon the buttocks or shoulders. Now and then, a severe sprain of the back is produced by a sudden twist of the body, such as occasionally happens when the trunk is forcibly rotated upon its axis, the lower extremities being at the moment implanted in a hole in the ground.

The extent of the injury varies. In some cases there is merely a stretching of the ligaments, whereas in others not only some of these structures, but also the muscles and aponeuroses of the back, are more or less contused and perhaps even partially lacerated. In the more severe forms of the accident, such, for example, as happen when a man receives a blow from the caving in of a sand-bank, a portion of the spine may be bent forcibly forward or to one side, almost to such a degree as to cause it to break. More or less blood is then generally poured out, and the muscles often present a very bruised, ecchymosed appearance. Severe, however, as the sprain usually is, the spinal cord always escapes serious injury, the principal effect being concussion.

The symptoms of this accident are generally well marked, if not positively diagnostic. Not infrequently there is excessive shock attended with partial paralysis of the lower extremities. The pain at the seat of the injury is more or less violent, and is always materially augmented by motion, pressure, and change of posture. The patient cannot raise himself up without resting his hands firmly upon his knees, nor can he walk without being supported by assistants. As he lies in bed, his body inclines forward, and he is unable to extend his limbs or turn upon his back. A good deal of swelling occasionally occurs, and, when there has been much extravasation of blood, the skin, after a few days, will be apt to exhibit a dark, mottled appearance. Sometimes there is bloody urine, from injury inflicted upon the kidneys.

Sprains of the spine, if at all severe, are always serious accidents. Death may be produced by mere shock, as in concussion of the spine, or it may be a consequence of the secondary effects of the injury, such as a deep-seated abscess, inflammation of the cord and its coverings, or organic disease of the kidneys. A lesion of this kind has occasionally been followed by stone in the bladder.

In the *treatment* of this class of injuries, the first indication is to relieve shock, and the second to prevent undue inflammation. Recumbency and the use of cordials will generally readily fulfil the former; the lancet, leeches, fomentations, and active purgation, the latter. If the patient is plethoric, blood should be freely taken as soon as reaction is established; the parts should be kept constantly covered with cloths wrung out of hot water, medicated with laudanum and acetate of lead; and Dover's powder, or morphia and tartar emetic, should be administered in full doses, to relieve pain and promote perspiration. If the suffering is excessive, a large blister may be applied, followed by the endermic use of morphia. After the severity of the injury has abated, the most suitable topical remedies will be sorbefacient and anodyne liniments, aided, if need be, by occasional dry cupping. When the patient is able to walk, benefit will accrue from the use of an opium plaster.

WOUNDS.

Wounds of the spinal cord may be of various kinds, and are extremely apt, even when of small size, to eventuate fatally, in consequence of their liability to be followed by inflammation and softening of the proper nerve-substance. Copious hemorrhage sometimes attends them, still further complicating the case by inducing severe, if not irremediable, compression. Very terrible effects are also frequently caused when the accident is accompanied by fracture of the vertebræ, with depression of the bone, which is sometimes driven across the cord in such a manner as to divide it as completely as if it had been done with a knife. At other times, small fragments of bone are buried in the substance of the cord. Paralysis, partial or complete, temporary or permanent, necessarily attends all lesions of this description. If the injury is very considerable, it may instantly destroy life, especially when it occurs above the origin of the phrenic nerves.

Gunshot wounds of the vertebræ, with lesion of the spinal cord, are nearly always, if not invariably, fatal. Of 22 cases of this kind which occurred in the English army in the Crimea, not one recovered. Even when the bones alone are injured, the danger is generally very imminent, most of the patients thus affected dying in a short time from inflammation of the cord and its membranes. When men fight behind trenches, terrible wounds, attended with excessive contusion and laceration of the muscles, are apt to be inflicted upon the back by shells, in consequence of the practice which they have, under such circumstances, of lying on the face while waiting for the explosion; such a position being regarded as the most safe. Of 157 severe cases of this description observed by the British surgeons in the Crimea, 20 died, 87 were sent to duty, and 50 were invalided.

An excellent illustration of this class of injuries is afforded by a case of gunshot wound of the spinal cord, which I attended with Dr. Thompson, in 1854. A gentleman, aged 29, was shot in the back with a pistol, the ball entering the left shoulder about two inches and a half below its top, and four inches and a half from the middle line. He instantly fell, as if he had been struck upon the head, and for a moment it was thought he was dead. It was ascertained, however, that he had merely sustained a violent shock; there was but little bleeding, and reaction soon followed. Intoxication existing at the time of the accident, it was impossible to make out a satisfactory diagnosis. The hands could be moved, but the lower extremities were completely powerless. The next morning, when the effects of the liquor had passed off, it was found that his body and legs were completely paralyzed, and that he was deprived of sensation all the way down from near the top of the sternum to the soles of the feet. The pulse was remarkably slow; the breathing heavy and laborious. The bowels were torpid, and the bladder had to be relieved with the catheter. The mind was clear and composed. These symptoms continued until he died, at the end of three days and a half. On dissection, it was discovered that the ball, lying loose in the spinal canal, had entered between the last cervical and first dorsal vertebræ, penetrating and pulpifying the cord, and cutting it in two by projecting across it a fragment from the injured bones.

In another case, of which I have the particulars but which I did not see, the ball entered near the right axilla, and, passing across the upper lobe of the corresponding lung, between the fourth and fifth ribs, cut the spinal cord in two, except a mere thread, and lodged in the body of the seventh dorsal vertebra.

Immediate loss of motion and sensation ensued, and the patient, a man aged 30, perished on the eighth day.

The subjoined case, kindly communicated to me by Dr. W. W. Keen, proves how much injury the spine may sustain without a fatal issue. A soldier was wounded at the battle of Gettysburg by a ball which entered the upper lip, and lodged in the body of the third cervical vertebra. Altogether about sixteen fragments of bone were at various periods removed or discharged, one of them including the anterior half of the vertebral foramen; and yet no hemorrhage occurred from the vertebral artery. At first paralysis of all the extremities existed, but this rapidly subsided after the extraction of the ball, and the man, who subsequently re-entered the service, entirely recovered without any deformity of the neck, although nearly the entire body of the vertebra must have been destroyed.

In regard to the *treatment* of wounds of the spinal cord, nothing of a definite character can be suggested; every case must be managed according to its own peculiar nature. The great object, of course, should be to moderate inflammation, and to prevent effusion and other ill effects. If foreign matter is present, pressing upon the cord, it should, if possible, be removed, though in attempting to do this there is great risk of increasing the original mischief. Trephining will not be likely to be of any service; the operation has been tried in a number of cases in depressed fracture of the vertebræ, but in none has it ever been productive of any benefit

Inflammation of the spinal cord, technically called *myelitis*, is rather a medical than a surgical subject, and may, therefore, very properly be passed over in a work of this kind.

LATERAL CURVATURE.

Lateral curvature of the spine is a very different affection from curvature produced by caries of the vertebræ; in the latter, the distortion is antero-posterior, and is essentially dependent upon organic disease of the osseous tissue; in the former, it is sideward, and is caused by irregular muscular contraction, acting upon weakened bones, fibro-cartilages, and ligaments, dragging them out of their natural position, and so inducing more or less deformity.

The *causes* which give rise to this irregular action on the part of the muscles, enabling those of one side of the middle line to overpower those of the opposite side, and so establishing a tendency in the spine to deviate from the straight position towards the side of the stronger muscles, are of a diversified character, and possessing, as they do, important therapeutic relations, are deserving of attentive consideration. These causes may be conveniently arranged under the following heads:—1. Affections of the muscles, as hypertrophy, atrophy, inflammation and spasmodic contraction. 2. Debility, either general or local. 3. Obliquity of the pelvis, from injury, disease or malformation of the inferior extremities. 4. Altered capacity of one side of the chest, causing increased action of the muscles of the opposite side. 5. Rachitic softening of the bones. 6. Defective development of the vertebræ.

Hypertrophy of the muscles, as a cause of spinal curvature, may be induced in a variety of ways; often simply by excessive use of one arm, in the exercise of a particular avocation. Blacksmiths, compositors, tailors, seamstresses, and dragoons are remarkably prone to this form of spinal disease. It is a law of the animal economy that muscles grow and expand in proportion as they are exercised. Hence, if, for example, the muscles of one arm are more developed than those of the other, the necessary result will be a loss of equilibrium, on the principle that the stronger always overpower the weaker, and, therefore, just in proportion as this preponderance of action exists on one side will the spine, if the muscles so affected are attached to it, be drawn over towards that side. The muscles which are most liable to inordinate development from this cause, are the trapezius and rhomboid; which, acting directly upon the spine, completely overpower their fellows of the opposite side, causing thus a marked curvature, the convexity of which corresponds to the hypertrophied limb.

An effect similar to the above is sometimes produced when the muscles of one side of the spine become atrophied while those of the opposite side retain their healthy condition. The balance between them being thus destroyed, it is easy for the muscles which possess the preponderance of power so to act upon the vertebral column as to induce more or less lateral displacement.

Similar consequences ensue when the muscles become disabled by *inflammation*, as occasionally happens in rheumatism; or by paralysis, as in severe contusions, and in failure of nervous influence; or by spasmodic contraction, as in wry neck, which, whenever it exists in a high degree, is always accompanied by curvature of the cervical portion of the spine, occasionally in a very high and distressing degree.

Debility of the muscles is a very frequent cause of spinal curvature; undoubtedly the most frequent of all. It may be general, or local; in the former case, affecting all the muscles, not only of the back, but of the rest of the body; in the latter, chiefly the spinal muscles. Any circumstance that depresses the vital powers must necessarily weaken the muscular system, and lead to irregularity of action, disqualifying it for the due performance of its functions. Lateral curvature of the spine may often readily be traced to the debility occasioned by protracted fever and exhausting discharges. The patient, on recovering from his attack, finds that the muscles of the back are too feeble to sustain the spinal column in the erect position, and that, consequently, when he begins to walk, it is drawn towards one side, which is always in the direction of the muscles having the preponderating influence. Effects of a like character are produced by the use of unwholesome food, starvation, and inadequate clothing, eventuating in an impoverished and anemic state of the system.

Among the more common exciting causes of local debility, considered in its relation to spinal curvature, are, *fatigue* of the muscles of the back from the protracted maintenance of the erect posture, and arrested growth from tight lacing. The evil effects produced by sitting daily for a number of consecutive hours, without any support for the spine, are well exemplified in young ladies at fashionable boarding-schools, and in young female operatives in crowded factories. The erector muscles of the spine, being continually kept upon the stretch, soon become exhausted, and by the constant repetition of the abuse are ultimately entirely disqualified for their task. If the child happens to be naturally feeble, or if she has become so by disease, the consequences of this practice are frequently most pernicious, the vertebral column being not only distorted laterally, but twisted more or less upon its axis.

The effects of *tight lacing* are known to every surgeon, not merely in their relation to spinal curvature, but in their influence upon the general health. There is not an organ of the body that is not injuriously affected by the corset, or that does not resent the "vile encroachment." Circulation, respiration, digestion, and secretion are all brought under its dominion. The muscles of the back are seriously restrained by it. Hence, if the practice is continued for any length of time, they must necessarily become stunted in their growth, and irregular in their action, unfitting them for the healthful discharge of their respective functions, those of one side being rendered stronger than their fellows of the opposite side, and so dragging the spinal column out of place.

Obliquity of the *pelvis* is invariably followed, if long continued, by lateral distortion of the spine, particularly in the lumbar region. A good illustration of this coincidence is afforded in diseases and accidents of the hip-joint, in which, in order to throw the weight of the body upon the sound limb, the pelvis of the affected side is elevated, and a curve is formed in the loins, by the constant strain upon the spinal muscles. Affections of the knee-joint give rise to similar results.

The effect of an altered state of the *chest* in producing spinal curvature is well exemplified in what occurs in empyema and chronic pleurisy, where, in consequence of the compression and obliteration of the bronchial tubes, and the extensive morbid adhesions between the pulmonary and costal pleuræ, the ribs sink in and lie almost in contact with each other, thus greatly diminishing the capacity of the thorax of the affected side, while that of the opposite side is proportionately increased. The shoulder corresponding with the seat of the disease is notably depressed, and its muscles are so much weakened as to permit their fellows on the other side to draw the spine over in that direction.

Rachitis is a common cause of lateral curvature of the spine, the bones being so weak as to be incapable of withstanding the action of its several muscles. This disease, which is essentially of an inflammatory nature, and which is almost peculiar to early childhood, is characterized by a great deficiency of earthy salts, in consequence of which the different pieces of the skeleton are rendered so soft and flexible as to permit themselves to be cut and bent in almost every direction. The vertebral column, of course, participates in the morbid action, and it is, therefore, easy to perceive how it must be affected by the various muscles which naturally influence and control its movements. Some of the very worst examples of curvature that we meet with are produced in this manner, the spine being drawn not only sidewards, but backwards.

Considerable lateral curvature of the spine is sometimes occasioned by an inequality in the length of the lower extremities, dependent upon disease, injury, or malformation.

Finally, lateral curvature may be caused by defective development or *malformation* of the vertebræ, some of the individual pieces being either too small or too large, or so united as to meet only at particular portions instead of at their entire surface, as in the natural state. The consequence of this arrangement is that the muscles of the spine, intent upon regaining their equilibrium, soon act unequally, those on one side overpowering those of the opposite side; not uniformly, but at different points, so as to induce, perhaps, the very worst form of distortion.

The *extent* of the curvature produced by these different causes is variable. Thus, it may be limited to one particular region, or it may involve one-half, two-thirds, three-fourths, or even the entire length of the spine. When the affection is very extensive, the curvature presents itself in the form of an Italic *f*, compensating curves being formed on the opposite sides. In the more common cases of lateral curvature the deformity begins in the upper dorsal vertebræ, on the right side, in an abnormal development of the deltoid, spinate, trapezius, and rhomboid muscles, which, overpowering their congeners of the opposite side, gradually drag the bones and everything that is connected with them over in the contrary direction, thus forming the first or middle curve of the series. The equilibrium between the muscles being thus destroyed, nature is not slow in her efforts at restoring it; but the only way in which she can accomplish this is by forming compensating curves, of which there are generally two, one in the lumbar region and the other in the cervical, their development usually occurring simultaneously, and, of course, in a direction opposite to the primary. There are instances, however, although they are rare, in which one continuous curve exists on one side, evidently depending upon paralysis of the muscles on the opposite side. A sigmoid curve can never rectify itself, and hence such cases are often irremediable, simply because it is impossible to establish a counterbalancing power in the congenerous muscles. The external characters of lateral curvature of the spine are well displayed in figs. 93 and 94.

Lateral curvature, in its more aggravated states, is always attended with marked rotation of the spine, the rotation existing in the direction of the convexity of the curvature; the vertebral column is diminished in length in a degree proportionate to the lateral deviation, and the chest is materially altered in its figure, the ribs being flattened, elongated, and twisted, and the sternum and costal cartilages tilted prominently forwards, and depressed towards the pelvis. The scapula on the side corresponding to the convexity of the thoracic curve is unnaturally large and elevated; its upper border is directed forwards and inwards, while the inferior angle is carried outwards, and hangs off in a very unseemly manner from the side of the chest, in consequence either of the elongation of the latissimus muscle, or on account of the escape of the bone from beneath its surface. A lumbar curve always gives rise to obliquity of the pelvis, and a cervical one, to

Fig. 93.

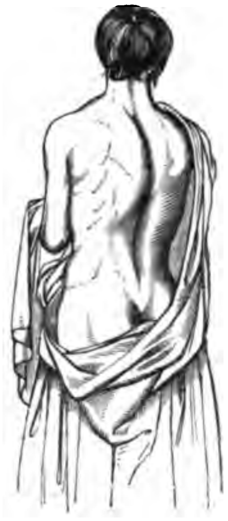
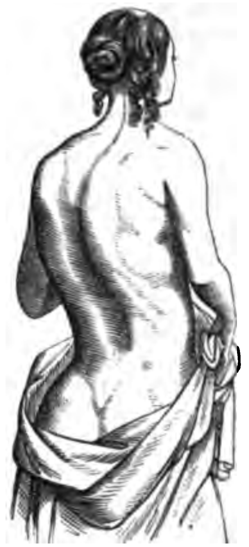


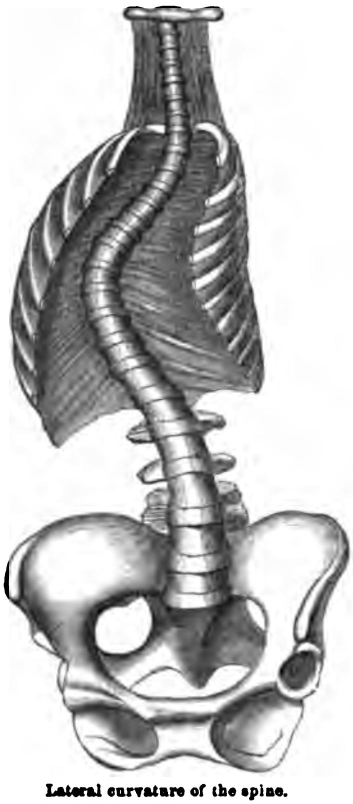
Fig. 94.



Different forms of lateral curvature of the spine.

obliquity of the head; so that there is occasionally, in reality, a quintuple curve.

Fig. 95.



Lateral curvature of the spine.

In the earlier stages of the affection, the curvature is effected chiefly at the expense of the intervertebral cartilages and ligaments; but, as it advances, the bones themselves become involved in the disorder, some portions being absorbed, and others strengthened, by the addition of new osseous matter.

The annexed drawing, fig. 95, from a preparation in my collection, affords an excellent illustration of the vertebræ and ribs in the milder forms of lateral curvature.

The *symptoms* of lateral curvature of the spine are subject to considerable diversity, depending mainly upon the extent and duration of the lesion. In general, they are only such as are denotive of functional disturbance of the thoracic and abdominal viscera. In the milder cases, the patient experiences merely some degree of inconvenience in walking, becoming easily fatigued during exercise, and suffering from occasional palpitation of the heart, with, perhaps, some degree of uneasiness in breathing. Gradually, however, the general health begins to fail; progression, and the maintenance of the semi-erect posture become more and more irksome; gastric and intestinal derangement supervene; the bowels are apt to be constipated; pains are complained of in the side and back; dysmenorrhœa is often present; and the countenance exhibits a pale, careworn, and chlorotic appearance, indicative of the crowded and compressed condition of the thoracic, abdominal, and pelvic organs.

Lateral curvature of the spine, to a slight degree, exists in almost all persons on the right side, owing to the fact that nearly every one naturally uses the right arm more than the left. Hence, the corresponding muscles are always more developed, and, acting with more vigor than their congeners, usually draw the dorsal, or dorso-cervical, region a little over to the right; hardly, however, to an extent sufficient to deserve the name of disease. Considered as a morbid affection, it is most commonly observed in young girls, from the age of five to fifteen or eighteen, especially in such as are naturally of a feeble constitution, or whose health has become early impaired by want, exposure, and imperfect nutrition.

The *prognosis* of lateral curvature is generally favorable when the affection is recent, or of slight extent, in a person of comparatively healthy constitution. Proper management will then usually effect complete restoration, although the treatment will require time and perseverance. Not unfrequently the mere rectification of a bad habit, causing an unnatural strain upon a particular set of muscles, will remove the complaint. When the affection depends upon extensive paralysis of the spinal muscles, organic disease of the vertebræ or of their cartilages and ligaments, or serious lesion of the pelvis, hip, or knee, great improvement may be effected, but a complete cure will be difficult, and probably impracticable. The prognosis is also unfavorable in cases of long standing.

The *treatment* of lateral curvature must be governed, in great degree, by the nature of the exciting cause; hence, before any measures are instituted for its relief, the most careful inquiry should always be made with reference to this particular circumstance. So long as the cause under whose influence the disease has been developed is permitted to continue in operation, it will obviously be impossible to make any favorable progress towards a cure.

The mere discontinuance, temporary or permanent, of a particular avocation will often speedily overcome the affection, by enabling the muscles of the two sides of the vertebral column to regain their equilibrium, upon the loss of which the trouble depends. Thus, the lateral curvature which results from hypertrophy of the muscles of the right shoulder and arm of the blacksmith, from a want of proportionate use of the other limb, may eventually be completely removed, if early attended to, before there is any structural change in the bones, cartilages, and ligaments, simply by transferring the hammer to the left hand. The steady, daily exercise of the left limb will soon bring out the full strength of its muscles, while those of the right arm, now comparatively quiet and inactive, will gradually be reduced in volume and force, and so in time permit a restoration of the balance of power, and, along with it, a return of the spine to the straight position.

The lateral curvature of the spine, contracted by girls at school and by children at factories, from a vicious habit of sitting, standing, or reclining, by which the vertebral muscles lose their equilibrium, can only be successfully cured by a reference to the nature of the exciting cause. The awkward and constrained position must be promptly rectified, and means adopted to improve the general health, when this has been suffering, by gentle exercise in the open air, sea-bathing, the cold shower-bath, and a properly regulated diet. Great attention must be paid to the gait in walking, so as to bring into full play the enfeebled and faulty muscles; the spine should be well supported while in the erect position by a light and well adjusted brace; and the child should be requested to lie down frequently during the day, in order to afford complete relaxation and rest to the entire system, so conducive to comfort and the restoration of vigor.

When the affection is manifestly dependent upon debility, or want of tone in the general system, tonics will be indicated, and should be of such quality and given in such quantity as may be calculated to improve rapidly the condition of the blood and solids. The various chalybeate preparations, either alone or in union with quinine or tincture of bark, generally produce an excellent effect, and should be administered, steadily and persistently, for several successive months; the dose being occasionally varied, or a new article added, to relieve the monotony of the treatment. When marked emaciation exists, cod-liver oil will come in play, and will often rapidly improve both flesh and strength. The diet should be judiciously regulated; it should be perfectly plain and simple, but at the same time sufficiently nutritious in the smallest compass, so as not to crowd the stomach and bowels, or to interfere with the movements of the diaphragm and the expansion of the lungs. Fresh milk and sweet cream should be freely used, together with an allowance of brandy, wine, porter, or ale, suitable to the age and condition of the patient. Frequent ablutions with strong soap and water, or some alkaline solution, followed by dry friction, the occasional employment of the shower-bath, and gentle exercise in the open air, or, when this is impracticable, swinging in a hammock, the body being in a perfectly passive condition, will be valuable adjuvants. Shampooing the back, twice daily for thirty minutes at a time, is often of signal benefit in imparting tone and energy to the weakened muscles, and is deserving of more attention in this particular class of cases than it has hitherto received. When the muscles are exhausted by paralysis, the cold douche, the electric current, and gentle flagellation will prove useful, and may be employed conjointly with tonics and minute doses of strychnia.

Lateral curvature depending upon obliquity of the pelvis is not always curable, inasmuch as the cause itself does not invariably admit of removal. When this is the case, the weakened spine may be supported by appropriate stays, and by attention to the position of the body in progression, standing, sitting, and reclining. Similar means must be adopted when the fault lies in the chest, as in retrocession of its walls from empyema and pleuritic adhesions.

The treatment of rachitis, considered as a cause of spinal curvature, need not be particularly discussed here, inasmuch as it has received sufficient attention elsewhere. It is essentially an inflammatory affection, associated with, if not directly dependent upon, impaired nutritive action of the osseous tissue, attended with a deficiency of earthy matter, and consequent softening of the skeleton. The treatment must be alterant and tonic, and the spine must be mechanically supported until the bones have acquired a sufficient degree of solidity to enable them to resist effectually the influence of the muscles of the back.

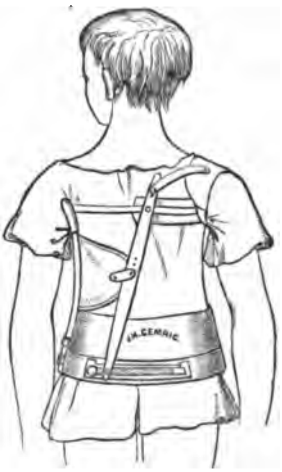
When the affection is caused by inequality in the length of the two limbs, it may in general be readily rectified by inclining the body habitually to the opposite side, and by increasing the thickness of the sole of the shoe by the interposition of a narrow piece of cork.

Lateral curvature, dependent upon defective development of the vertebræ, requires early and persistent mechanical treatment, to sustain the weakened spine, and afford the affected parts an opportunity of being moulded into a more suitable shape for the due performance of their functions. The occurrence, which is, fortunately, very rare, is apt to be overlooked until it is too late to benefit the patient.

The treatment of lateral curvature, however induced, derives important aid, in almost every case, from mechanical support of the spine, and much ingenuity has been expended of late years in the invention of suitable apparatus, of which there is, consequently, a vast amount before the profession, all constructed upon the same principles, although possessing different degrees of merit. It may be stated, as a general rule, that the more light, airy, and simple such apparatus is, the more comfortable it is for the patient, and the better adapted to the removal of the distortion. It should consist of five principal pieces, as the necessary framework, of which two are horizontal and three vertical, connected together by screws and hinges. Of the former, one corresponds with the hips and the other with the shoulders; of the latter, two extend up along the sides of the trunk into the axillæ, their superior extremity being crutch-shaped for the more easy support of the arms, while the third or intermediate one rests upon the spine. The whole apparatus is well cushioned to ward off pressure, and is kept in place by straps and buckles. Counter-pressure may be made, if deemed advisable, upon the convexity of the thoracic curve, by means of an appropriate pad secured to the middle upright piece of the apparatus; and, when there is considerable displacement of the cervical vertebræ, a head-piece may be added.

The apparatus may be worn day and night; and, although it may at first prove irksome, such is the comfort derived from its use that the patient will soon be loth to be without it.

Fig. 96.



Apparatus for the correction of lateral curvature.

The apparatus, sketched in fig. 96, will afford a general idea of the principle upon which such a contrivance should be constructed.

The bed upon which the patient lies should be furnished with a smooth and elastic mattress, in order that the body may not sink into any hollows or depressions, at the same time that it should be sufficiently soft to insure the requisite comfort. The object, however, of this arrangement is not to confine the sufferer to her bed beyond the hours which are necessary for a due supply of sleep and repose after exercise. In the antero-posterior displacement of the spine, or Pott's disease, rest and recumbency, absolute and unconditional, are enforced, and scrupulously maintained for many months; here, on the contrary, rest and recumbency, although highly important, are not trusted to alone, but are carefully conjoined with gentle exercise in the open air, either on foot, in a carriage, or on horseback, as may be found most convenient or suitable to the patient. The body, in short, must be invigorated, and the faulty muscles set in action by their appropriate stimulus, namely, motion, varied, diversified, and frequently repeated.

With out-door exercise is often advantageously combined a gentle course of gymnastics; but to derive full benefit from it, it should be conducted under the immediate superintendence of a regular master of the art, well acquainted with the exigencies of the case; otherwise immense harm instead of benefit will be likely to ensue.

Myotomy, as a remedy for the cure of this affection, is now seldom practised, experience having shown that it is generally entirely useless. The only cases to which it is at all applicable are those in which there is marked contraction of the muscles and aponeuroses of the spine, when it may occasionally be advantageously performed as an auxiliary to other measures.

TUBERCULOSIS OF THE SPINE.

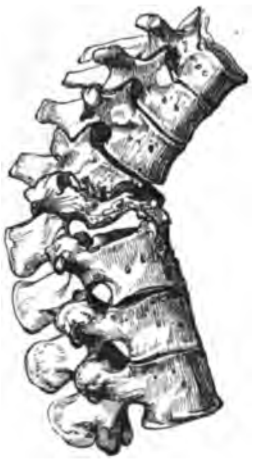
The bodies of the vertebræ being composed, in great measure, of areolar tissue, invested by a thin layer of compact substance, are liable to tubercular deposits, similar to those which are so frequently met with in the carpal and tarsal bones, and in the articular extremities of the long bones. The affection, from its destructive character, is one of very grave import, and has, therefore, always engaged the earnest attention of surgeons. It has been, however, only within a comparatively recent period that its true nature has been properly understood. It was reserved for Mr. Pott, towards the latter part of the last century, by a series of masterly observations and dissections, to point out its etiology, pathology, and treatment, and so completely did he exhaust the subject that nothing of any real importance has been added to our knowledge of it since his death. Indeed, so graphic is his account of the disease that it is now generally known by his name.

Although the disease may occur in any portion of the spine, yet it is much more common in the dorsal region than in either the cervical or lumbar, the second, third, and fourth pieces being especially prone to suffer. It is generally stated that the lumbar vertebræ are more frequently affected than the cervical, but this I believe to be an error; at all events, my own practice has supplied me with a greater number of cases of the lesion in the latter than in the former. It is impossible to assign any reason why caries of the vertebræ should be so much more common in the dorsal region of the spine than elsewhere; but such is unquestionably the fact, and the circumstance is one of great importance, both in a diagnostic and practical point of view.

Pott's disease occurs in both sexes, in all classes of society, and at different periods of life, although it is much more common in children from the age of three to twelve years than at any other time. I have met with it as early as the fifteenth month, and cases are occasionally observed as late as the thirtieth, or thirty-fifth year, but these are rare, and must, therefore, be regarded as exceptions to a general law, which constitutes this a disease of early childhood. It is most common in the lower walks of life, among the ill-fed and half-starved occupants of the crowded lanes and alleys of large cities, and always recognizes, as its essential cause, a strumous state of the system. Like tubercular disease of the lungs, it is, in fact, merely a local manifestation of a constitutional vice, or a general dyscrasia of the blood and of the solids. This, therefore, constitutes the great and fundamental principle of the disease; the indispensable condition of the system which precedes the outbreak of the local affection. External injury, exposure to cold, and various other depressing influences may excite the malady into action, but no such occurrence could possibly happen from these or any similar causes, if no tendency to the disease existed in the constitution at the time of their application.

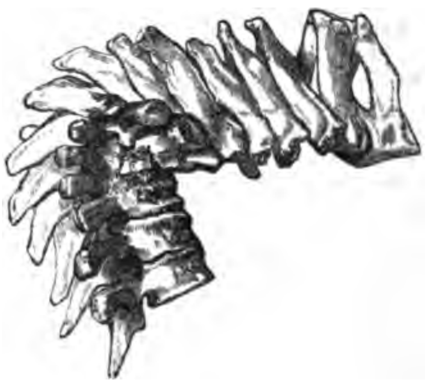
The tubercular matter, which is the immediate cause of caries of the spine, is deposited in the areolar structure of the bodies of the vertebræ, either as an infiltration, or in the form of distinct, rounded masses, from the size of a millet seed to that of a pea, a few of which are sometimes encysted. It is not improbable that more or less is also occasionally deposited upon the surface of these bones, beneath the periosteum, in the substance of the periosteum, or in the interior of the intervertebral cartilages, or perhaps in all of these situations simultaneously or successively. How long it exists before it becomes softened and disintegrated, we have no means of knowing; the period, doubtless, varies in different cases and under different circumstances, but, on an average, it probably does not exceed five or six months, the substance obeying the same laws here as in other parts of the body. Be this as it may, when the process has once fairly commenced it generally proceeds very rapidly, so that it often produces very serious havoc in the course of four or five weeks, completely annihilating the affected structures, and causing great and irremediable deformity. If a dissection is made at this stage of the malady, a gap, fig. 97, the size of which corresponds with the number of vertebræ affected, will be found to exist in front

Fig. 97.



Caries of the vertebræ; the bodies being extensively destroyed.

Fig. 98.



Angular curvature from caries.

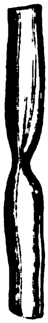
of the spine, occupied by unhealthy strumous matter, the débris of disintegrated bone, and fragments of fibro-cartilage and thickened periosteum. The spinal cord and the roots of the spinal nerves will be observed to be more or less denuded, and the remnants of the diseased vertebræ to be thrust backwards in such a manner as to cause an antero-posterior curvature, very marked behind, in consequence of the unnatural projection of the spinous processes, as in fig. 98. When the lesion is seated in the dorsal region, the adjoining ribs often participate in its ruinous effects, and the matter is sometimes extensively diffused over their internal surface, as well as over the anterior and lateral aspect of the spinal column.

The number of vertebræ involved in this disease is variable; sometimes it is limited to a single piece, but most generally it attacks two or three, the spongy substance of which, together with the intervening fibro-cartilages and the contiguous periosteum, is eventually completely destroyed.

Symptoms.—The affection usually comes on in a slow and stealthy manner, and hence it often makes very serious inroads both upon the part and system, before its true character is even suspected by any one. Among the earlier symptoms is an appearance of gradually declining health; the patient looks pale and feeble; his appetite and bowels are irregular; the gait is vacillating and tottering; the strength easily gives way under exercise; the lower extremities are the seat of numbness and occasional spasmodic twitching; a sense of pain and discomfort is felt along the spine, particularly at the affected part; the urine is alkaline and scanty; the sleep is disturbed by moans and restlessness; and there is not unfrequently a good deal of fever at night, followed, perhaps, by considerable perspiration towards morning. By and by the symptoms assume a more decided character. The pain in the back increases, and pressure upon the part generally causes a peculiar sickening sensation; a feeling of constriction is experienced in the chest, as if it were girded by a tight cord; the difficulty of walking rapidly augments; the general debility becomes more and more marked; and the numbness in the lower extremities steadily advancing, is now generally conjoined with a disagreeable prickling feeling, evidently the result of pressure on the spinal cord. The paralysis accompanying the disease exists in various degrees; in some cases it is extremely slight, and hardly attracts attention; in others, on the contrary, it is so great as to deprive the patient completely of the power of progression. Usually motion is impaired before sensation. The adjoining cut, fig. 99, beautifully exemplifies the effects of the compression which the spinal cord sometimes undergoes in angular curvature of the vertebræ.

The *deformity* of the spine is always characteristic; it is angular backwards, fig. 100, and varies in extent according to the number of vertebræ affected, and the duration of the disease. It is limited to the seat of the disease, and is often associated with a kind of knob-like enlargement of the neighboring parts, especially conspicuous when there is serious involvement of the ribs. In the more aggravated cases, the spine is bent back many inches beyond its natural level, the chest is singularly elongated in the antero-posterior direction, the sternum is pushed out in front, and the head is sunk down between the shoulders, causing that peculiar humpbacked appearance which forms so striking a feature in the symptoms of this disease in its confirmed stages. If the body is viewed in profile, the chest will be found to represent the outline of a triangle, the apex corresponding with the affected part, and the base with the sternum and costal cartilages. These appearances are well represented in fig. 101, from a preparation in the Mütter collection.

Fig. 99.



Section of a spinal cord in a case of paraplegia, with angular curvature of the vertebræ.

The matter which forms in this disease may be absorbed; or it may accumulate, and ultimately seek an outlet, either through the back near

Fig. 100.

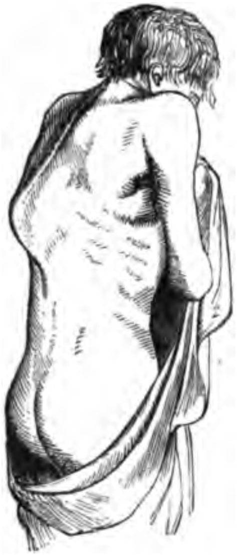
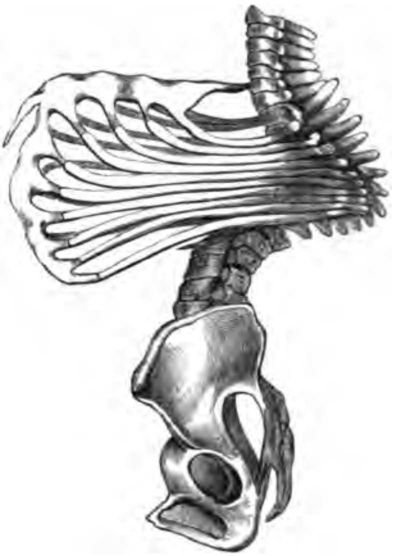
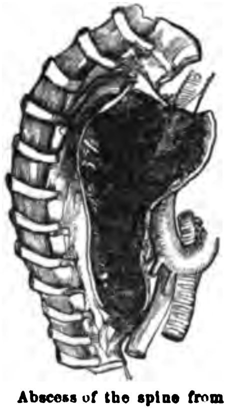


Fig. 101.



Posterior curvature of the spine.

Fig. 102.



Abscess of the spine from caries of the vertebræ, the cyst in which the matter is confined being interposed between the bone and the aorta.

the seat of the disease, or it may gravitate along the front and sides of the spine, as in fig. 102, and eventually point in the groin, the lumbar region, or the upper part of the thigh.

Diagnosis.—The diagnosis of this disease, although in general quite easy, requires some care, especially in the incipient stages of the attack. No one can mistake it after the occurrence of excurvation. The affections with which it is most liable to be confounded are sprains, rheumatism, neuralgia, hysteria, and spinal abscess.

Tuberculosis of the vertebræ usually occurs before the tenth year. The pain, which is one of the earliest symptoms, is referred to a particular portion of the spine; it is of a dull, heavy, aching character, and is always increased by pressure, exercise, or any sudden twist of the body. The patient, if old enough, generally describes it as being of a sickening nature. Gradually the individual becomes stoop-shouldered; he leans forward as he walks, his arms and feet are spread out, and he lifts himself with difficulty. By and by, he experiences prickling sensations in his extremities, especially the inferior. The local trouble augments, and now, if the parts are carefully inspected, a certain degree of curvature will be found to exist, at first very slight, but steadily progressive, and unmistakably characteristic.

The symptoms of this disease are sometimes painfully simulated by a sprain of the back; and, when this is the case, the diagnosis can only be determined by a most thorough examination of its history.

Rheumatism and neuralgia of the spine are very uncommon in children, and, when they do occur here, they are generally associated with similar attacks in other parts of the body.

The distinction between hysteria and this affection is sufficiently broad. The former seldom occurs until after the age of puberty, whereas the latter is nearly always met with prior to that period. Hysteria is most common in females, and is generally associated with disordered menstruation.

Abscess of the vertebræ is seldom seen at an age when tuberculosis of the spine occurs. Besides, the matter rarely points in the situation of Pott's disease, unless it forms as a consequence of it. A psoas abscess, as it is termed, usually points just above Poupart's ligament, at the upper part of the thigh, or in the ilio-lumbar region.

The history of the case often supplies important light. The subjects of Pott's disease are commonly very young children, of a puny, sickly, anemic character, with light hair, eyes, and complexion, a tumid belly, and cold extremities, with a tendency to cutaneous eruptions and strumous affections in other parts of the body.

In all cases of suspected disease of the vertebræ a most thorough examination should be made until all doubt about its nature is cleared up. For this purpose the patient should be completely stripped of his clothing, and made to walk back and forth, with a view of observing his gait, or the manner in which he lifts himself. He should then be placed upon his abdomen, and pressed carefully with the thumb along the spine, in its entire length. If there is any disease it will be sure to manifest itself by the pain, tenderness, or sickening sensation that will thus be awakened. If, notwithstanding this, any doubt exists in regard to the nature of the affection, the patient should be treated precisely as if it were scrofulous disease, otherwise precious time may be lost under the supposition that the malady is rheumatism, neuralgia, or hysteria.

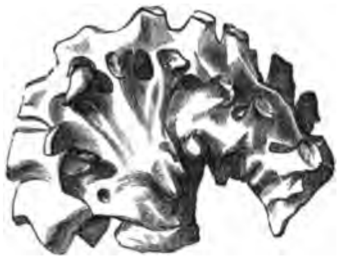
Prognosis.—A disease which makes such sad inroads upon the part and system as this is necessarily a grave disorder under any circumstances; but when it occurs, as it generally does, in children of a broken-down, miserable constitution, ill-fed and half-naked, or whose bodies are completely saturated with the strumous diathesis, the prospect of an ultimate cure must be very limited indeed. Many such patients perish from hectic irritation, while the majority of those who recover are doomed to a wretched existence, permanently dwarfed, and hump-backed. In the better class of subjects restoration is the rule, death the exception; and it is well to know that, if the case is properly managed, excellent cures, with little or no deformity, may be made even when the disease has already produced considerable structural change.

When the disease is located in the cervical region, the prognosis is generally less favorable than when it affects the dorsal or lumbar; yet most extraordinary recoveries are now and then witnessed, the patient getting well apparently in despite of the malady. One of the most remarkable instances of this kind that I have ever seen occurred recently in a young man, a private patient of mine, who, notwithstanding a most severe attack of caries of the superior cervical vertebræ, has got a very good use of the neck, although the upper portion is so completely anchylosed that, in attempting to look sideways, he is obliged to turn his whole body round. A great exuberance of callus has formed over the affected pieces, giving the neck a very full, heavy appearance.

When the cervical vertebræ are extensively affected, the disease not unfrequently proves fatal, death occurring in one of several ways. First, an abscess may form, and destroy life, either by bursting into the larynx, or into the spinal canal; in the one case instantly suffocating the patient, and in the other not less certainly killing him by inducing compression of the spinal cord. Secondly, dislocation of the odontoid process may occur in consequence of ulceration of the transverse ligament; and, lastly, life may be suddenly extinguished by injury inflicted upon the spinal cord, by the accidental giving way of some of the diseased vertebræ.

The manner in which the gap is filled up, when a cure is effected in this disease, constitutes one of the most interesting features in its history. As soon as the morbid action is arrested, nature sets up a process of repair, consisting, in the first instance, in an effusion of plastic matter. This often begins at one part, while the disease is still going on in another; a circumstance which greatly conduces to recovery, as much time is thus saved. The restorative process advancing, the plasma is gradually organized, and thus becomes the nidus of the new bone by which the breach in the bodies of the vertebræ is finally closed up, the development of the osseous tissue taking place in strict conformity with the laws of ossification in the fœtus. The new substance is extended, like a bridge, across the spinal canal, and does not, therefore, encroach at all upon its contents; it is more solid than natural bone, and is usually several shades whiter. It connects together not only the contiguous bodies of the vertebræ, but also the remnants of the arches and spinous processes, soldering them into one solid, immovable mass, as in fig. 103. The heads of the adjoining ribs generally experience a similar fate. It will thus be seen that the cure of this disease is by anchylosis.

Fig. 103.



Remarkable example of angular curvature and anchylosis, with spontaneous cure.

Treatment.—Caries of the vertebræ being merely, as already stated, a local manifestation of a general strumous vice, its treatment necessarily resolves itself into topical and constitutional, the latter holding the chief rank. I include, of course, among the constitutional means, rest in the recumbent posture, one of the most important elements of success in the management of every case of this kind, as an absolute, indispensable condition, not to be violated or departed from on any consideration whatever. If any one feels inclined to doubt the value of this precept, it will only be necessary for him to look around and behold the many hump-backed persons that everywhere meet his eye, to be satisfied of his error. Every object of this kind is a standing, living monument of the miserable treatment that is so generally pursued by the practitioners of this country. The very nature of the case suggests the propriety of absolute rest and recumbency. One need only observe the havoc committed by the disease to be convinced how utterly impossible it is for the weakened and crippled spine to support the superincumbent head and shoulders; it must inevitably yield under the heavy weight, and the distortion thence resulting must necessarily be in direct proportion to the amount of pressure thus maintained, and the extent of the gap left by the destruction of the bodies of the vertebræ. The reason why the curvature is posterior, is because the spinous processes, preserving their integrity, tend to drag the affected parts in that direction. Now all this may be effectually obviated by the observance simply of the recumbent posture, maintained faithfully and steadily, not for a few weeks or months, but, if necessary, for more than a year; in short, until nature has succeeded in bridging over the gap with new bone, capable of supporting the superincumbent weight. Until this is accomplished, the patient must on no account be permitted to rise off his couch for any purpose whatever. When this period has arrived, the surgeon will generally be made aware of it by the solidity and firmness of the affected parts, and the indurated and enlarged condition of the structures immediately around the seat of curvature, as well as by the subsidence of the more important functional symptoms.

It is a mistake to suppose that a person laboring under caries of the spine will not brook confinement, or that it will tend to impair the general health; those who have the largest experience in this matter know better. A child may be taught obedience to anything, especially when it is designed to relieve pain and suffering; he may resist at first, but a few days are generally sufficient to break him in, and to make him docile and contented, if not perfectly happy. It is not necessary that he should lie all the time in one posture; the prone position is undoubtedly the best, as it relieves the parts of congestion and pressure, but he may lie on his back, side, or belly, as he may find it most agreeable, and generally he manages this matter of his own accord, without any prompting from any one. No pillow should be placed under the head, as it is important that the occiput should be on a line with the spine, in order that no pressure whatever may be made upon the affected parts. The bed may be a common trundle one, with a good hair, moss, or cotton mattress.

Rest and recumbency, then, are of paramount importance in every case of caries of the spine, and the earlier they are employed the less danger will there be of ultimate deformity. It is the very first injunction that should be delivered by the surgeon when he prescribes for such a disease.

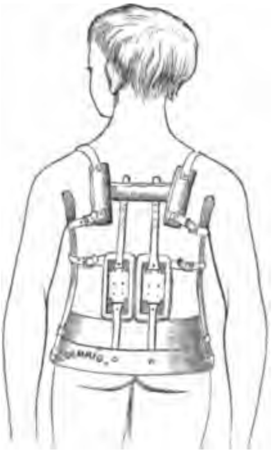
The constitutional remedies, properly so called, must depend upon circumstances. In general, the patient will be benefited by a course of chalybeate tonics, cod-liver oil, and a light but nutritious diet, with an occasional dose of blue mass. If fever be present, or if there be marked disorder of the bowels and secretions, an active purgative may sometimes be required; but, in general, it will be most judicious to avoid the employment of all kinds of depressants. The pain may be such as to demand, now and then, an anodyne, especially if it is so great as to interfere with sleep. Night-sweats are best relieved by quinine and aromatic sulphuric acid, and ablutions with tepid alum water, assisted by dry frictions and exposure of the body to the fresh air. Milk punch, ale, porter, and wine may be used if there is marked debility.

The principal local remedy is an issue made with the actual cautery, which is incomparably superior, so far as my experience enables me to judge, to all other modes of counter-irritation of which I have any knowledge. It should be placed either on one side of the affected part, or immediately below or above, as may be deemed most convenient, and should be at least as large, when the eschar has dropped off, as a half dollar. Such a sore will not only yield an abundant discharge of pus, easily maintained for several months, but afford an excellent surface for the endermic application of morphia, if this should be considered necessary, on account of the severity of the pain. The ordinary pea issue is of no use in such a case, while that made with Vienna paste is altogether inferior to one made with the hot iron; for this instrument, besides destroying the integument, makes a powerful impression both upon the part and system, which is not the case with any other material. As to the seton, Mr. Pott long ago stigmatized it, in speaking of it in connection with this disease, as "painful and nasty," and I am sure that every sensible surgeon will concur with him in opinion. If the discharge from the issue flag, it must be promoted by the application of stimulating unguents, a small blister for a few hours, or a little Vienna paste. A second application of the cautery is seldom necessary in any case.

When there is reason to suppose that the parts have been sufficiently repaired to enable them to sustain the weight of the head, the patient may be permitted to rise, not, however, without having previously been provided with a suitable supporter. Such an instrument, to answer fully the object which it is intended to subserve, should combine lightness with strength, and should be constructed in such a manner as to come well up under the arms, at the same time that it makes gentle yet efficient pressure against the weakened spine, in the greater portion of its length. A hollow pad may be adapted to the angular projection behind. An idea of what such an apparatus should be may be formed by a reference to fig. 104.

No mechanical support should be used during the progress of the ulcerative action, except when it involves the cervical region, in which case some application of the kind is imperatively demanded, lest, in an unguarded moment, the affected pieces should suddenly cave in, and thus fatally crush the cord.

Fig. 104.



Apparatus for the relief of posterior curvature.

PSOAS ABSCESS.

In consequence of disease of the vertebræ, pus not unfrequently forms at the anterior and lateral aspect of the spine, which, as it accumulates, gradually descends towards the lower part of the trunk, where it ultimately points and is discharged, the event being preceded by the appearance of a fluctuating swelling. When the fluid passes down in front of the psoas muscle, the disease takes the name of psoas abscess, whereas, when it proceeds backwards towards the loins, it is called lumbar abscess; a distinction which, although topographically correct, must not be regarded as implying any difference in the nature of the two affections, inasmuch as observation has proved them to be perfectly identical in character.

An abscess of this kind is essentially a strumous disease, which can occur only in persons of a strumous predisposition. It is not surprising, therefore, that it should often be associated with tubercular disease in other parts of the body, especially of the lymphatic ganglions, lungs, and mucous follicles of the large bowel. The disease, rarely met with before the age of puberty, is most common between that period and thirty-five. I have never seen it in very young or in very old subjects. Both sexes are liable to it; males suffer, however, more frequently than females, but in what ratio is not known. It generally comes on without any assignable cause, although the patient is very apt to attribute it to the effects of cold, sprains, blows, or sudden twists of the body. Its march is always essentially chronic.

Dissection shows that these abscesses always take their rise in strumous disease of the bodies of the vertebræ, commencing either upon their outer surface or in their cancellated structure. Occasionally there is reason to believe that it begins in the intervening fibro-cartilages, if not also in the neighboring periosteum. I have never seen an instance whose origin was not fairly traceable to spinal disease. The affection is sometimes double, an abscess occurring on each side, either simultaneously or within a short time of each other. The contents of a psoas abscess are of a tubercular character, precisely like those of a chronic abscess in the soft parts or of a strumous joint. They are usually intermixed with flakes of lymph, and cases occur in which they contain small particles of bone, or of bone and fibro-cartilage. The fluid, which varies in quantity from a few ounces to several quarts, is always inclosed by a distinct cyst, rough or villous internally, and firmly connected to the neighboring structures; it is of a dense, fibrous texture, and ranges in thickness from the fourth of a line to the sixth of an inch. In cases of long standing its length sometimes reaches an extent of from eighteen inches to two feet; occasionally it forms one continuous pouch, but more frequently it exhibits a sinuous arrangement, branches being sent off laterally. The psoas and iliac muscles are always atrophied, inflamed, discolored, and partially degenerated into fatty matter.

The *symptoms* of spinal abscess—for so this disease should be called rather than psoas abscess—are variable. The morbid action always begins in a slow, stealthy, and insidious manner, the patient being entirely unconscious for a long time that he is the subject of so serious an affection; he feels, perhaps, somewhat unwell, and finds that he is gradually growing weak and losing flesh and appetite; his face looks pallid, his sleep is irregular, and he occasionally has slight attacks of fever, followed by perspiration. At a still later period, exercise becomes exceedingly irksome, and he now begins to limp, especially after walking; he also finds it difficult to extend his trunk and thigh, so that when he is up or going about, he is obliged to lean forwards a little towards the affected side, in order to relieve the parts of tension. A good deal of soreness is usually complained of in the back and iliac regions, extending along the front of the thigh; but anything like severe pain is seldom felt. After some time, varying from three to six months, a tumor becomes perceptible, soft, compressible, and fluctuating distinctly under the finger. When seated in the groin, or in the upper part of the thigh, it generally receives a marked impulse on coughing, and recedes more or less on recumbency, especially when conjoined with considerable elevation of the pelvis. In the lumbar and gluteal regions, on the contrary, coughing and position usually make no impression upon it. When the abscess points in the groin, a superficial observer might mistake it for an inguinal hernia; but the history of the case, the distinctness of the fluctuation, and the situation of the swelling, which is usually much nearer to the spine of the ilium than in rupture, will always afford just grounds for a correct diagnosis. When the tumor appears at the upper and inner part of the thigh, the only disease with which it is liable to be confounded, in its early stages, is femoral hernia.

The march of psoas abscess is usually steadily onward; so long as the sac retains its integrity the general health is often comparatively little affected, but as soon as it is opened, whether spontaneously or artificially, and the air is permitted to mingle with its contents, the constitution manifests at once the most lively sympathy, as is evinced by the rapid supervention of rigors and hectic fever, with all its train of evils.

The symptoms are at first not well marked. There is no uniformity in regard to the precise spot where the abscess points, although this is generally just above Poupart's ligament, external to the iliac vessels. Sometimes the matter gravitates down in front of the thigh, beneath Poupart's ligament; and I have met with cases where it showed itself on the outside of the limb, upon the nates as low down as the tuberosity of the ischium, in the iliac region above the anterior superior spinous process of the ilium, and in the interior of the pelvis, its contents being finally evacuated into the bowel or bladder. Pointing in the lumbar region is by no means uncommon. In a few rare instances the matter has been known to issue at the perineum or at the thyroid foramen, forming a tumor at the upper and inner part of the thigh. The period between the commencement of the disease and the occurrence of ulceration varies, on an average, from four to six months.

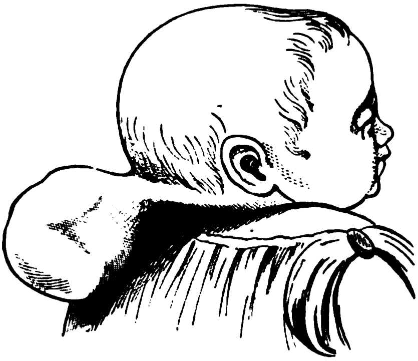
The *prognosis* of this disease is generally unfavorable, most patients perishing from its effects in from twelve to eighteen months. Very few, if any, ever make a good, permanent recovery. In most cases death occurs from hectic irritation, profuse sweats, and colliquative diarrhœa, either as the direct result of the abscess, or of the abscess and of lesion of other organs, especially of the lungs and bowels.

The *treatment* of spinal abscess is altogether unsatisfactory. Generally several months elapse before the true nature of the disease is ascertained, and then its ravages will usually be found to be of such a character as to render all efforts at a cure utterly hopeless. If a free, dependent outlet could be formed for the matter early in the disease, the probability is that the patient might occasionally get well; but when it is considered how much the osseous and other structures suffer before the fluid reaches the surface, it is not surprising that these cases should so uniformly prove fatal. Moreover, it is not to be forgotten that the abscess is merely a symptom of a general tubercular dyscrasia, which is, in itself, an unfavorable omen, as it is always likely to be followed by serious disease in other, and, perhaps, still more important organs. If the affection is left to itself, it will be sure to destroy life, and the event will hardly be any the less certain if it be surgically interfered with. Subcutaneous evacuation of the matter, as proposed by Abernethy, is not of the slightest use as a curative agent; in the many cases in which I have tried it, no benefit whatever resulted, except that it occasionally afforded temporary relief from pain. The operation is always, in a very short time, followed by hectic fever, and by more or less rapid failure of the health and strength, no matter how carefully it may have been performed. Very frequently not even palliation is derived from it. Sorbefacient applications, in the form of lotions, unguents, or plasters, are of no particular use. When the sac has been opened spontaneously, advantage may sometimes accrue from the injection, twice a day, of tepid water, followed by some slightly astringent and anodyne fluid, or a very weak solution of iodine; but too much caution cannot be observed in the employment of this and similar measures, lest violent local and constitutional irritation be excited, thereby hurrying off the patient. Alterants may do good by improving the general health, but not as curative measures. In the latter stages of the disease, tonics and a nutritious diet will be necessary, with aromatic sulphuric acid to allay perspiration, and anodynes to procure sleep and arrest diarrhœa.

HYDRORACHITIS.

Hydrorachitis is a congenital defect, consisting in a cleft of the vertebral column, with a protrusion of the lining membranes of the spinal cord. The lesion, which is caused by an arrest of ossification, and consequent deficiency of the vertebral rings, is generally situated in the lumbar region, but occasionally it affects the dorsal, cervical, or even the sacral. It is frequently associated with hydrocephalus, and is analogous to those malformations which originate from a want of union of the two halves of the fœtus during utero-gestation, such as hare-lip, cleft-palate, and umbilical hernia.

Fig. 105.



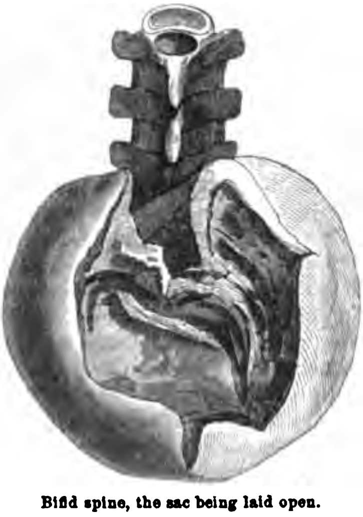
Bifid spine, as developed in the neck.

The adjoining drawing, fig. 105, from a clinical case, a boy six weeks old, shows a rare form of this disease. The tumor, which was seven inches and a half in circumference, was quite soft, fluctuating, and tender on pressure, though free from inflammation. The child's health was excellent.

The malformations of the spinal column accompanying this affection may be arranged under the following heads:—1, division of the entire vertebra, even of its body; 2, partial or complete absence of the lateral arches; 3, perfect development of the lateral arches with want of union at the median line.

The protrusion of the spinal envelops generally takes place during the latter months of fœtal life; occasionally, however, it is not observed until some weeks or months after birth. When the tumor first shows itself, it may not be larger than a pea; but, as the disorder progresses, it gradually increases in size, varying in proportion to the deficiency of the vertebræ. Although the swelling usually does not exceed the size of an orange, it occasionally reaches that of the fist, and even of the patient's head. The skin is commonly very smooth, delicate, and thin; sometimes, however, it retains its normal thickness, or it becomes red, rugose, and horny; in a few rare cases, it is entirely wanting. The tumor is either soft, flabby, and fluctuating, or it is full, hard, and shining; when pressed upon, it gradually diminishes in volume, or completely recedes; but no sooner is the force removed than the fluid re-accumulates, and the part regains its previous bulk. In its form, the swelling is globular, ovoidal, or pear-like, with a short, narrow neck, by which it reposes upon the cleft bone. Fig. 106, from a preparation in my possession, exhibits a tumor of this kind in the lumbar region; it was about the size of a common orange, and was taken from a child five months old. Its cavity, which is here laid open, had been exposed by ulceration.

Fig. 106.

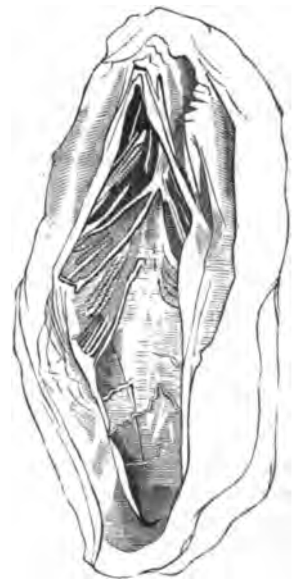


Bifid spine, the sac being laid open.

The fluid in hydrorachitis is generally of a thin, limpid character, slightly saline in its taste, and almost uncoagulable. In some instances, it is of the color and consistence of synovia, or it contains flakes of lymph and particles of pus. These appearances, however, are seldom present until after the swelling has burst, and discharged its original contents. The tumor usually consists of a single cyst; but there may be several, as in the multilocular variety of ovarian dropsy. In such a case it would be difficult, if not impossible, to draw off all the fluid by operation.

The contents of the vertebral canal in the immediate neighborhood of the lesion are variously affected. The portion of the spinal cord surrounded by the tumor is often very much softened; and, on the other hand, it may be abnormally hard; sometimes it is not so large as natural; and cases occur in which it deviates remarkably from its accustomed route, being forced through the opening in the vertebræ, and partially contained in the swelling. The nerves are always more or less displaced; very often, indeed, they are dragged out of the canal, and spread over the inner surface of the cyst in a beautiful plexiform manner, not unlike that of the fleshy columns of the heart, as exhibited in fig. 107, from a preparation in my collection.

Fig. 107.



Bifid spine, showing the disposition of the nerves.

Hydrorachitis is one of the most fatal of diseases. Few children survive their birth longer than five or six months, while many perish in a much shorter time, death being caused either by convulsions, or by ulceration of the sac, and the sudden escape of its contents. It is true, life has sometimes been sustained until the age of puberty, and, in one case, until the fifty-fifth year; but such instances, although encouraging in a practical point of view, are altogether of an exceptionable character, and cannot, therefore, be used for the establishment of any general law. If the tumor is ruptured during parturition, the infant is nearly always still-born, and if it is opened after birth, either accidentally or designedly, death usually follows in a few hours, the immediate cause of dissolution being convulsions from the pressure being taken off the brain in consequence of the loss of the cephalo-spinal liquid. The case is always likely to have a speedily fatal termination when it is associated with hydrocephalus, paralysis of the inferior extremities, or involuntary discharge of the urine and feces. Moreover, it may generally be regarded as being of a more hopeless character when it affects the cervical region than when it is seated in the dorsal, lumbar, or sacral.

The *treatment* of bifid spine is anything but satisfactory; for modern science, while it has been so suggestive of improvement in almost every other branch of surgery, has made no additions, even of a plausible nature, to what was known respecting the management of this malformation a quarter of a century ago. When the tumor is small, or of moderate size, a cure may occasionally be effected by keeping up constant pressure with collodion and a common roller, or a cup-shaped truss, lined with a thin air-cushion, so as to diffuse the pressure equally over the entire swelling. The compression should be aided by the occasional evacuation of the contents of the sac by subcutaneous puncture with a very fine trocar or bistoury, the opening being well closed immediately afterwards to prevent the introduction of air. Only a portion, however, of the fluid should be drawn off at a time; if the whole is removed at once, convulsions will be inevitable, and from such an attack the child may perish in a few hours, the brain being unable to bear the sudden loss of pressure caused by the escape of the cephalo-spinal liquid. Sir Astley Cooper, early in life, treated successfully a case of cleft spine with simple compression alone; and, in another instance, soon afterwards, he was equally fortunate by combining this method with repeated punctures, as had been previously proposed by Mr. Abernethy. Subsequently, he employed the same measures in two other instances, one of which proved fatal, very unexpectedly, at the end of forty days, everything having before been in a promising condition, while the other recovered, at the expiration of a year and a half, after the tumor had been punctured thirty times, and the child had been given over as lost. Favorable results have also followed this plan of treatment in the hands of other practitioners, both in this country and in Europe, and is, I am satisfied, the only safe one of which we have at present any knowledge. The smaller, of course, the tumor is, the more likely it will be to succeed; if it is of inordinate size, or even if it is comparatively diminutive with a broad base, and a large cleft in the vertebræ, no treatment of any kind can be of any but the most transient benefit, and then only in the way of support with a view to the prevention of ulceration and the accidental rupture of the sac.

Benjamin Bell and other surgeons have suggested tying the base of the sac with a ligature, with a view of removing the tumor, and preventing further propulsion of the spinal membranes; but the results that have been published in favor of the operation are such as not to warrant a repetition of it. I have myself the particulars of several cases of this kind that have come either under my own immediate observation, or that have been communicated to me by other practitioners, and in every one the effects have been most lamentable, the patient dying either immediately after the operation from convulsions, or a short time afterwards from an extension of the inflammation to the spinal cord and its envelops. The same may be said of the operation of excision after ligation of the pedicle, and the application of the actual or potential cautery for the purpose of exciting adhesion between the opposing surfaces of the sac. All such procedures cannot be too pointedly condemned, as being both unscientific, and certain to prove fatal. The only case in which ligation can ever be proper is where the sac has an uncommonly narrow pedicle, with an exceedingly small aperture of communication, but even then the safer practice unquestionably would be systematic compression in union with occasional puncture.

Dubois, with the hope of gradually diminishing the size of the tumor, and of ultimately agglutinating the serous surfaces at its base, proposed the application of pressure, at this particular point, by means of two narrow steel plates, regulated by two screws, and prevented from slipping by passing two stout needles immediately in front of them, across the swelling. In this manner he succeeded, it is alleged, in curing his patient.

Finally, it has been proposed to cure hydrorachitis by *injections* of iodine; an operation first performed by Dr. Brainard in 1848, and since then repeated by him, up to 1859, in five other cases. In addition to these he has reported five cases that have occurred in the hands of other surgeons, and, it would seem, that neither in these nor in his own have there been any dangerous effects produced. All practitioners, however, have certainly not been equally fortunate. In two cases of my own, the particulars of which my limited space will not permit me to detail, and in several others reported in the medical periodicals, the operation was followed by death, either from the rupture of the sac, or the violence of the resulting inflammation. Whether the procedure is as free from danger, or as successful, as the facts presented by Dr. Brainard would seem to warrant, is a question which time alone can determine. The most unfavorable cases, of course, are those in which the disease is complicated with hydrocephalus.

Dr. Brainard's rules for performing the operation are: 1st, to make the puncture subcutaneously in the sound skin, by the side of the tumor; 2dly, to evacuate no more serum than the quantity of fluid about to be injected; 3dly, to withdraw the contents of the sac, if symptoms of irritation supervene, and to replace them immediately with distilled water. The patient should lie on his side or face after the operation, and, if there is much heat, warm evaporating lotions should be applied to the part and head. When the tumor becomes flaccid it should be covered with collodion, or supported by pressure, continued for some weeks after the cure has been perfected; and, lastly, the injection should be repeated as often as may be necessary, care being taken that the previous irritation has completely subsided.

The operation is performed with a very delicate trocar, the puncture being accurately closed with adhesive strips. The active ingredients of the solution are iodine and iodide of potassium, in the proportion of one-fourth of a grain of the former and thrice that quantity of the latter to the ounce of distilled water. When the sac is very thick and pedunculated, the strength of the solution should be much greater than ordinary, and the tumor, after being entirely emptied, should be thoroughly injected, washed out, and immediately re-filled either with its original contents or with distilled water. Pressure is applied during the operation in such a manner as to prevent any of the solution from entering the spinal canal.

HYSTERICO-NEURALGIC AFFECTIONS.

The spine is liable to a peculiar nervous affection to which the term hysterico-neuralgic may very properly be applied, as denotive of its pathological character. Although not very common, it is sufficiently frequent to render it an object of great practical importance, the more especially as it is extremely apt to be confounded with psoas abscess and tuberculosis of the spine. Mr. Brodie, in speaking of it, remarks that he has "known, not a few, but very numerous, instances of young ladies being condemned to the horizontal posture, and even to the torture of caustic issues and setons, for several successive years, in whom air and exercise, and cheerful occupations, would probably have produced a cure in the course of a few months."

The disease is met with chiefly in young females of a nervous, hysterical temperament, and generally coexists with disorder of the menstrual function and neuralgia in different parts of the body. It essentially consists in a hyperæsthetic condition of the spine, usually confined to some particular spot, from which, however, it is liable to shift to other parts. The sensibility frequently amounts to excessive pain, so that the slightest pressure, or motion, is productive of exquisite suffering. Sometimes the whole spine is tender. I have seen cases where the pain was limited, in great degree, to a single vertebra. The portions of the spine most commonly affected are the lumbar and dorsal. Occasionally the distress is seated mainly in the coccyx, the sacrum, or the sacro-iliac symphysis.

The pain, instead of being seated in the spine, is often confined to the skin, especially in the earlier stages of the attack. To determine this fact a careful examination is necessary, otherwise it may escape attention. The pain is frequently so severe as to render the slightest touch a source of extreme suffering. Even the pressure of the clothes is sometimes intolerable. It may be of a dull, aching character, or sharp and shooting; and it is not uncommon for it to radiate about in different directions, extending perhaps into the chest, abdomen, or pelvis. The general health always suffers. The appetite is irregular and capricious, the bowels constipated, the tongue more or less coated, the sleep disturbed and unrefreshing, the extremities habitually cold, and the whole surface remarkably susceptible to atmospheric impressions. Menstruation is scanty and painful; the urine high-colored and coated with lithic acid; the mind suspicious and excitable.

In the worst forms of the disease, the patient loses all control over herself. The legs are weak, and almost unable to support the weight of the body; the muscles are affected with involuntary spasms; prickling sensations are experienced in the limbs; the breathing is embarrassed by a sense of constriction in the chest; there is occasional retention of urine; and the patient is at length rendered entirely unfit for bodily exertion and social enjoyment.

Great care is necessary not to confound this disease with tuberculosis or spinal abscess. The danger of mistake exists chiefly in the earlier stages of the attack. After it has become chronic, the symptoms are generally too well marked to admit of error. The best way to avoid a wrong diagnosis is to subject the patient to frequent examinations, and to proceed upon the principle of exclusion.

The *treatment* must be by mild, not harsh, measures. Issues, setons, blisters, and pustulation with tartar emetic seldom fail to aggravate the mischief. The applications should be soothing, and consist mainly of anodyne plasters and embrocations. Even leeches are rarely of any use. The system should be built up with tonics, gentle exercise in the open air, travelling, the shower-bath, dry frictions, and a nutritious diet with alcoholic stimulants. A residence at the sea-shore is often highly advantageous; and nothing contributes more to the comfort of the patient than cheerful occupation. When the symptoms are of a decidedly hysterical character, benefit will accrue from valerian and assafœtida. In all cases the bowels and secretions must receive due attention.

TUMORS OF THE BACK.

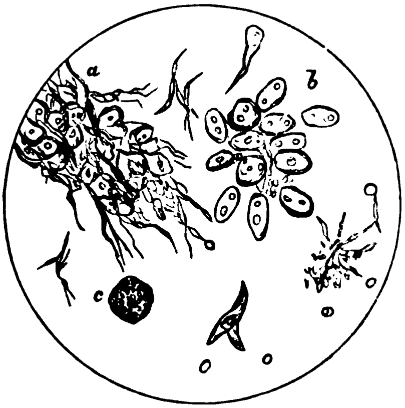
The morbid growths that are liable to occur in this region present nothing peculiar; they are strictly similar to those in other parts of the body, and, consequently, require the same kind of treatment. Of the benign formations the most common are the fatty and the fibrous, both of which occasionally attain an extraordinary bulk, especially when they are situated immediately beneath the integuments. When this is the case, they are frequently also very pendulous, or of a peculiar gourd-like shape, with a comparatively narrow attachment.

The *fatty tumor* lies generally immediately under the skin; it is of slow growth, of a doughy, semi-elastic consistence, free from pain, and unattended with any enlargement of the subcutaneous veins, excepting in cases of great bulk, when these vessels may exhibit almost a varicose condition. Dorsey removed from the back of a negress a fatty tumor that weighed twenty-five pounds. It had existed for eighteen years, and, although it was covered merely by the skin, it had formed very firm attachments to the spinous processes of the vertebræ, as well as to the muscles and aponeuroses of the back. As a preliminary step, the patient was placed for fifteen minutes upon her abdomen, and the tumor elevated and compressed by assistants, in order to empty it of blood, very little of which was lost during the operation. Rapid recovery followed.

When the fatty tumor is developed upon the shoulder, it is liable to contract very firm adhesions, so as to require a tedious dissection for its removal. In a case under my care not long ago, the growth, which was hardly the volume of a large fist, was bound down very closely by the long-continued pressure that had been exerted upon it by carrying a pack.

The *fibrous tumor* of the back is generally deep-seated, lying beneath the muscles and aponeuroses, by which it is firmly bound down to the ribs. Its most important diagnostic features are, its tardy growth, its dense, firm consistence, its immobility, and its confined situation. The general health is commonly unimpaired, but the patient often experiences a good deal of pain, usually of a dull, aching character. The tumor manifests no disposition to ulcerate. It is most common in elderly subjects.

Fig. 108.



a. Cells slightly treated with acetic acid; b. Single cells; c. Cells in a state of oily degeneration. × 420.

In a case upon which I recently operated at the College Clinic, in a woman, aged sixty-four, the tumor had many of the external features of a fibrous growth, but presented some peculiar microscopical elements which gave it an anomalous character. The growth, which had commenced nearly six years previously, was situated between the scapula and spine, in close contact with the ribs, and was of an elongated ovoidal form, its long diameter being upwards of eight inches. After removal, it was found to be of a white-grayish color, and of a firm consistence, very much like a fibroid formation, with the addition, here and there, of a caudate cell. The tumor had no capsule, but it was uncommonly vascular. The woman, under the judicious management of Dr. F. F. Maury, made a rapid recovery. The microscopical characters of the tumor are shown in fig 108, sketched by Dr. Fricke.

The *sebaceous tumor* rarely occurs upon the back. When it is developed here, its superficial situation, tardy growth, small size, and semi-elastic feel will always readily distinguish it from other formations.

Large *nevous growths* are sometimes met with here; generally of a venous structure, but occasionally of a real anastomotic nature, expanding freely under mental emotion, and pulsating synchronously with the heart. The venous form of the disease is sometimes associated with a varicose condition of the subcutaneous veins, and in this event an immense tumor may be formed, of a soft, spongy consistence, with a sensation, when it is firmly grasped, as if it were filled with bundles of earth-worms. Many of the larger veins contain phlebolites.

Of the malignant tumors that are liable to appear in this region, by far the most common is the encephaloid. Scirrhus, melanosis, and colloid are exceedingly infrequent.

The most formidable case of *scirrhus* that I have ever witnessed anywhere occurred upon the back of an elderly man, directly over the middle line, between the shoulder-blades. It commenced without any assignable cause, spread with remarkable rapidity, and, when I first saw it, along with Dr. McWhinney, about six months after its origin, it was nearly of the diameter of an ordinary saucer. The ulcer had a deep, excavated appearance, with hard, puckered edges, and was the seat of a copious discharge of thin, sanious, and offensive matter. The most striking feature of the case was the existence of an immense number of secondary tubercles in the skin of the trunk and extremities, varying in size from a pea up to that of a half dollar.

The *encephaloid tumor* of the back is always, according to my observation, deep-seated, lying beneath the muscles, in close contact with the ribs, or ribs and spine. It is most common in elderly subjects; and is generally readily distinguishable by its rapid growth, its great size, its lobulated surface, and its soft, semi-elastic consistence. In its earlier stages, it is entirely free from pain, but, as it increases in bulk, its pressure upon the surrounding parts often causes great suffering. Left undisturbed, it manifests little, if any, disposition to ulcerate; and the patient may live several years before he is finally worn out by hectic irritation.

Melanosis is very uncommon here, and, when it does occur, it nearly always happens as a secondary affection. Its black or bluish color, its situation in the skin and subcutaneous cellular tissue, its nodular form, its small size, and its firm, dense consistence are features by which it may always be easily distinguished from other formations, whether malignant or benign.

The *treatment* of these various morbid growths requires no special notice. There is one point, however, which is deserving of particular consideration in connection with their extirpation when they are deep-seated, in close contact with the spine, or spine and ribs. When this is the case, an elaborate dissection is generally required for their liberation, and there is always great risk of copious hemorrhage, not so much from the arteries in this situation as from the veins, which form large plexuses at the junction of the ribs and the transverse processes of the vertebræ. When these vessels, which are destitute of valves, and which are known as the vertebro-costal veins, are divided, they pour out blood in great profusion, and in a manner which renders it frequently impossible to arrest it without the ligature.

In all deep-seated tumors of the back, the knife should be carried in a direction parallel to the spine, first through the integuments, and next through the muscles, down to the morbid mass, which should then, if possible, be liberated by enucleation. Care should be taken not to cut into the morbid structure, especially if it is of an encephaloid nature, otherwise there will inevitably be profuse hemorrhage. Any large veins that may be divided should promptly be tied. The wound, after the operation is completed, should be well supported with a compress and bandage.

CHAPTER IV.

INJURIES AND DISEASES OF THE FACE.

THE face, considered as an independent region, is composed of thirteen bones, for the most part very thin and delicate or thick and porous, intimately connected together, and remarkably vascular. Its numerous muscles are chiefly concerned with the organs of mastication, taste, and sight. Its arteries are derived from the external carotid; its veins empty into the jugular; and its nerves proceed directly from the brain. The soft structures of the face are endowed with great sensibility, and their supply of blood is naturally very great; circumstances which exercise an important influence upon the injuries and diseases of this region of the body.

The principal affections to be considered under this division are the various kinds of wounds, especially the incised, contused, and gunshot. Of diseases, properly so called, very little need be said, as they will be fully discussed under other heads.

Incised Wounds.—Incised wounds of the face present nothing peculiar, except that they are frequently attended with copious hemorrhage, especially when they penetrate to a considerable depth or involve the bones, which, as already stated, are remarkably vascular. In their treatment, the usual rules of practice are to be observed, but additional care is requisite in approximating and maintaining their edges, otherwise, when the cure is completed, the patient's countenance may be disfigured by an unseemly scar. The best retentive means are small, delicate pins, or the finest cambric needles, inserted in the same manner as in the operation for hare-lip, the threads being so arranged as to obviate the necessity of adhesive strips, which, in no event, must alone be trusted to, as they are extremely liable to be displaced by the action of the muscles of the face. I have myself long been in the habit of employing very slender gold pins in wounds of this region, and there is no mode of dressing that is so likely to be followed by a satisfactory cure. With a sharp point and a head of sealing-wax, they are easily introduced, and may be retained for almost any length of time without the risk of provoking irritation.

When incised wounds of the face are complicated with extensive separation of the soft parts, or of the soft parts and of the bones, it may be necessary, in addition to sutures, to use a compress, confined by adhesive strips or a suitable bandage, the object being to afford gentle and equable support to the flaps.

Contused and Lacerated Wounds.—Contused and lacerated wounds of the face are sufficiently frequent, and are liable to be followed by very unpleasant effects, both temporary and permanent. Among the former are blood-stains, ecchymoses, extensive tumefaction, severe pain, and erysipelas; among the latter, disfiguring scars and paralysis of some of the muscles from injury to their nerves.

A curious wound of the face, partly contused and partly incised, is occasionally inflicted by a blunt weapon operating upon the sharp border of the superior maxillary and malar bones. The parts present very much the appearance as if they had been divided by the sharp edge of a knife, at the same time that they are more or less bruised, and perhaps even discolored. A similar effect is occasionally produced by the edges of the teeth driven forcibly by a blunt body against the lips and cheeks.

In the *treatment* of these lesions, the most important indication, after the removal of foreign matter, is the gentle approximation of the parts with the pin or wire suture, followed by cold water-dressing, aided, if there is much contusion, by the addition of a little alcohol. The edges of the wound must be placed in the most accurate apposition, and the greatest care taken to keep down inflammatory excitement.

Contusions.—Contusions, properly so called, of the face are always attended with more or less bleeding into the connecting cellular tissue, elevating and discoloring the skin, the hues varying from slight purple to deep scarlet, which, during the progress of the case, in consequence of the changes effected in the extravasated fluid, gradually diminishes in intensity, becoming at first brownish, then greenish, and finally yellowish. The most common sites of these effusions are the eyelids and cheeks, on account of the great abundance and laxity there of the areolar substance readily admitting of infiltration. One of the best examples of such an accident is the "black eye" of the pugilist, caused by the rupture of the vessels of the lids and the extravasation of their contents into the connecting structures. Considerable swellings of this kind are occasionally met with in the lips and chin, and even upon the nose, especially its upper part. In fractures of the base of the skull, large quantities of blood are often poured out into the cellular tissue of the orbit, surrounding and compressing the globe of the eye.

The most suitable remedies for the relief of these accidents are cold water and sorbefacient lotions. If there be much pain and swelling, the best application, at least for the first few days, will be a moderately strong solution of acetate of lead, Goulard's extract, or hydrochlorate of ammonia, with a small quantity of laudanum. For the milder forms of these accidents, the tincture of arnica, more or less diluted, is often prescribed, and, in general, its beneficial effects are very striking, the pain, swelling, and ecchymosis rapidly disappearing under its influence. Mild spirituous lotions, camphor water and laudanum, or a mixture of vinegar and water, may also be employed with advantage. When the extravasated blood refuses to yield to these and other measures, as occasionally happens when the parts are very much bruised, or when the fluid exists in large quantity or is devitalized, the best plan is to let it out by means of a small puncture, otherwise it may cause suppuration and other unpleasant effects.

Gunshot Wounds.—Gunshot injuries of the face are most liable to happen when men are fired at behind entrenchments. During the war in the Crimea, altogether, 533 cases of these lesions came under treatment among the English soldiers, or 7.4 per cent. of the entire wounded. Of this number 382 were cases of simple flesh contusions and solutions of continuity, 272 being slight, and 108 severe. In 107 cases the wounds penetrated or perforated the osseous structures, and in 44 they were complicated with injuries of the eyes; in 42 of one, and in 2 of both. Of the entire number only 14 died, or 2.6 per cent. of those treated. Of 40 cases which occurred among the officers, including 15 of more or less severity, not one proved fatal.

The mortality in wounds of the face would thus appear to be remarkably slight, a circumstance which is the more surprising when it is recollected that these injuries are often attended with severe laceration of the soft parts and extensive fracture and comminution of the bones. The immunity, however, is readily accounted for by the fact that the face contains no vital organ, by the large quantity of blood sent to this region, and by the free anastomosis of its vessels. For these reasons the fleshy and osseous structures readily unite in cases, generally, even of an apparently desperate character. For the same reason mortification and necrosis here, as a result of contusion and fracture, are extremely rare.

Wounds of the face from shell, grape, and cannon shot are, other things being equal, more dangerous than those inflicted by the Minié or common rifle ball. The risk from hemorrhage, erysipelas, and pyemia, is much increased, and the deformity is often frightful and irremediable, the lesion, perhaps, involving the lips, nose, cheeks, jaws, tongue, and one or both eyes.

In the treatment of gunshot wounds of this region, the rule is to save all and sacrifice nothing, as it is impossible, in any case, to determine beforehand whether the parts, even if desperately injured, will not readily heal when properly dealt with. Perfectly loose or detached pieces of bone should, of course, be removed, and any rough or sharp angles that may exist should be pared away with the pliers, so as to place them in a better condition for ultimate, if not speedy, reunion. The edges of the soft structures may sometimes also be advantageously trimmed or smoothed off, although care should be taken not to remove any more than is absolutely necessary to insure their more accurate apposition. Maintenance is effected by the wire suture, aided by adhesive strips; the roller may usually be dispensed with. If the injury is very extensive, tepid water-dressing, with the addition of a little alcohol or tincture of arnica, will answer better than cold, at least for the first few days; but in general the latter will be preferable.

One of the great sources of annoyance and danger in gunshot injuries of the face is hemorrhage, which is often exceedingly profuse and difficult to arrest from the great depth of the vessels, or the manner in which the blood wells up at the bottom of the wound. The only way to put an effectual stop to it is to secure every bleeding artery, however minute. When the trunk of the internal maxillary is divided, each extremity must be included in a separate ligature, precisely as in hemorrhage of the main artery of a limb. When the blood oozes out at numerous points, the flow may usually be easily arrested with the tampon, or the tampon and styptics, of which Monsel's salt and ice are among the very best. In desperate cases, it has been proposed to tie the common carotid artery, but such an expedient can seldom, if ever, be successful, owing to the free anastomosis of the branches of the two opposite vessels.

Secondary hemorrhage is of frequent occurrence in these lesions, sometimes commencing within a short period after the accident; and, although it may cease spontaneously, it is occasionally controlled with much difficulty.

When the injury of the fleshy structures is accompanied with extensive fracture of the bones, the fragments should be carefully moulded into shape, and retained by light dressings. Everything like severe pressure must be avoided, as the parts will be particularly intolerant of such interference.

When a large portion of the lower jaw is shot away, the tongue, having lost its muscular connections, is apt to fall back upon the glottis, threatening suffocation. To counteract this tendency, all that is generally required is to place the head in the prone position. If, notwithstanding this precaution, alarming symptoms arise, the point of the tongue should be transfixed with a silver wire, so that the organ may at any moment be drawn forward by the patient or his attendants.

In the management of wounds about the face, mouth, and throat, special care must be taken not to permit the offensive mucous and salivary secretions to pass into the stomach. The neglect of this precaution is liable to be followed by a low typhoid state of the system, very similar to what occurs in pyemia, or blood-poisoning. These effects are very common in bad cases of gunshot wounds of this region, and I have repeatedly had occasion to notice them after operations upon the jaws, mouth, and even the nose.

Another bad effect of these wounds is paralysis, partial or complete, of the face, from injury to the branches of the facial nerve. Loss of sensation will be experienced if there is severe contusion or division of the branches of the fifth pair.

The horrible and disfiguring gaps of the face consequent upon these lesions occasionally admit of closure by an autoplastic operation, the flaps being borrowed from the neighboring surface, or partly from this and partly from the arm.

Tumors.—Various kinds of morbid growths, benign as well as malignant, are liable to appear in the face, commencing either in the skin, in the cellular substance, or in the osseous tissues; but as they do not differ, in any essential particular, from similar diseases in other regions, they do not require any elaborate notice.

The *sebaceous tumor*, of which a sufficiently full account is given in the chapter on the diseases of the skin, is quite common in this region. It is easily distinguished by its tardy development, its mobility and freedom from pain, and by its soft, elastic consistence. Its shape is generally somewhat ovoidal, and its volume ranges from that of a pea up to that of an almond. The skin over it is usually perfectly healthy.

The *fibrous tumor* is occasionally, but very rarely, seen in this region, mostly directly over the antrum of Highmore; slow of growth, firm in its consistence, capable of attaining a large bulk, and liable to recur after extirpation.

The *fatty tumor* of the face is met with chiefly in the upper eyelids, in connection with which it will hereafter be described. Upon the cheeks and lips I have never seen an instance of it.

The *cystic tumor* sometimes occurs in the face, generally, if not invariably, as a congenital vice. In a case of this kind which fell under my observation in 1860, the size of the tumor was enormous. It involved the greater part of the left side of the face and neck, extending, on the one hand, from above the ear to the clavicle, and, on the other, from the angle of the mouth and nose to the posterior border of the sterno-cleido-mastoid muscle. The disfigurement was very great. A most extensive and tedious dissection was necessary; but, notwithstanding this, the child, who was only six weeks old, bore the operation well, and made a very rapid and complete recovery.

Cystic formations in this region are generally multiple, the number of cells being sometimes very great; they are nearly always closely grouped, have thin transparent walls with serous contents, and vary in size from that of a millet-seed up to that of a large marble. In cases of long standing their walls and contents are liable to undergo various transformations, thus materially changing their original character. The only remedy is excision.

Aneurism by anastomosis, generally in the form of a congenital vice, not unfrequently occurs in the face, and requires the same kind of management as in other parts of the body. The great rule, when an attempt is made to remove such a growth by excision, is to carry the knife through the sound tissues, and not through its substance.

A purely *venous tumor*, also generally of a congenital nature, is liable to appear on the face, and is easily and safely dealt with by excision, the operation, if proper care is taken, being almost bloodless even when the growth is of inordinate bulk. The annexed sketch, fig. 109, represents a large growth of this kind, which I removed from the left side of the face and lip of a young lady twenty-

Fig. 109.

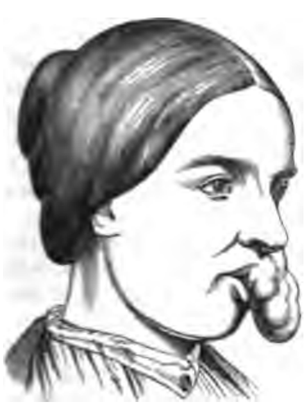
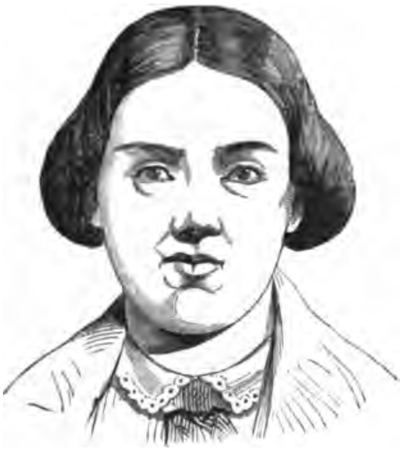


Fig. 110.



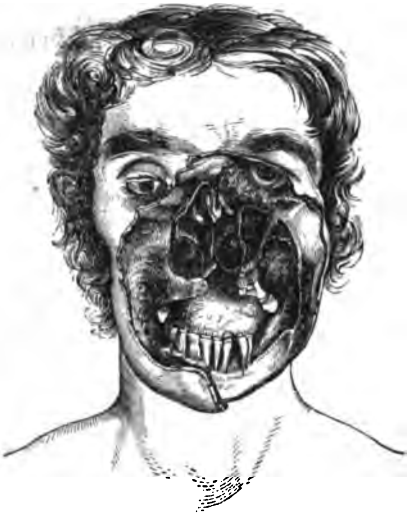
Venous tumor of the lip and cheek.

four years of age, with the loss of hardly three ounces of blood, although the operation necessarily involved the division of the coronary artery. The tumor had commenced early in life, and had greatly disfigured an otherwise very pretty face. During the excision, it literally shrunk away to nothing. Fig. 110 shows the result of the operation.

In the parotid region it is not uncommon to find enlargements of the lymphatic ganglions and various malignant affections, seated either in these bodies or in the substance of the parotid gland. To these particular attention will be directed under their appropriate heads.

Warts often grow upon the face, where, besides their unseemly appearance, they are frequently a source of irritation and annoyance, not to say anything of their liability, in some cases, to take on malignancy. As long as they are stationary, and not productive of inconvenience, they may be let alone, otherwise they should promptly be removed.

Fig. 111.



Corroding lupus, or epithelioma of the face.

The only malignant disease of the face requiring passing notice here is the *corroding lupus*, or epithelioma, of which the annexed sketch, fig. 111, from Dr. Druitt, affords an admirable illustration. Generally taking its rise in the form of a little fissure, superficial ulcer, or warty excrescence of the skin, it gradually extends in depth and circumference until at length it involves, in many cases, the entire face—integument, muscle, cartilage, and bone—leading thus to the most frightful suffering and deformity. The period at which death occurs varies, on an average, from eighteen months to four or five years. Now and then, although very rarely, the disease, after having committed extraordinary ravages, gradually stops, the parts cicatrize, and the morbid action never recurs. The treatment of corroding lupus has been sufficiently discussed in the chapter on cutaneous affections.

Broad and unsightly *cicatrices* of the face, especially those consequent upon burns and scalds, often admit of removal by a very simple operation, the vicious parts being included in two incisions, the edges of which are afterwards carefully approximated by suture. When the loss of substance is very great, it must be supplied with integument borrowed from the neighborhood.

Finally, in surgical operations upon this region, especially such as are necessary for the removal of various kinds of morbid growths, the incisions should be planned with reference to the least deformity. This is generally best done by carrying the knife in the direction of the folds of the skin, when any exist, or where they will be likely to occur as the patient grows older. The most unseemly and disfiguring cicatrices are, as a rule, those which follow perpendicular or very oblique incisions.

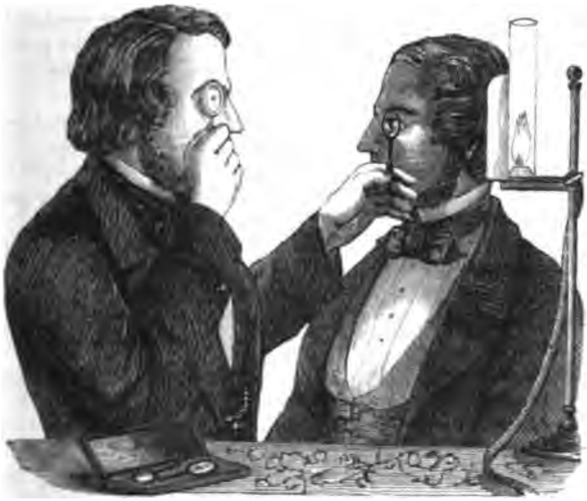
CHAPTER V.

DISEASES AND INJURIES OF THE EYE.

THE most important discovery of the present century, as an auxiliary to the study of the diseases of the eye, is the ophthalmoscope, a contrivance by whose aid the dark background of this organ may be lighted up, and its delicate tissues clearly inspected. Of the many instruments of the kind now in use, that devised by Dr. Anagnostakis, of Athens, is perhaps the most simple and valuable, combining, as it does, great facility of application with portability and cheapness. At all events, it is, with some unimportant modifications, the one now most generally employed. It essentially consists of a lens and of a concave, circular mirror, about two inches in diameter, perforated in the centre by a small hole, to the back of which is fitted a plate of blackened copper, the whole being inclosed in a brass ring and mounted upon a short handle.

During the examination, which must be made in a dark room, the mirror is held in one hand, and the lens close before the eye in the other. Unless this precaution be adopted, it will be impossible, in the great majority of cases, although the bottom of the organ may be highly illuminated, to obtain a distinct view of any of its individual parts. The lens may be bi-convex or bi-concave, with a focus from one and a half to two inches, the former affording an inverted, and the latter an erect image. The inspection with the bi-convex instrument is generally to be preferred, as it is more easy, less trying to the eyes of the surgeon and the patient, and more satisfactory in regard to the range of the retina. In either case, the pupil must be dilated with atropia, in the proportion of one-twentieth of a grain to the ounce of water, a small quantity of which is applied several times to the eye a few hours before.

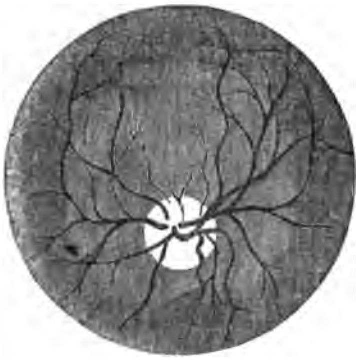
Fig. 112.



Mode of conducting an ophthalmoscopic examination.

The surgeon and the patient sit immediately opposite to each other, near a table furnished with a bright lamp, or, what is better, an argand burner, placed just behind the patient's ear, as in fig. 112. The speculum is held in the right hand, in such a manner as to throw the light from the lamp into the affected organ. The observer then looks through the hole in the instrument, and approaches or recedes from the patient's face, keeping the flame all the while steadily upon the eye, until he sees the pupil appear of a bright-red color. The double convex lens, held between the thumb and index finger of the left hand, is then brought close to the affected organ, when, by slowly moving the mirror back and forth, he can soon find the proper focal distance, and readily see a distinct bloodvessel, as well as other objects, at the bottom of the eye. This distance should be as firmly maintained as possible, and the vessel followed to its entrance into the optic papilla. This is done either by moving the mirror slowly from side to side, or, what is better, by moving the lens slightly in a similar way, keeping in mind that the objects at the bottom of the eye move in the opposite direction from the lens. The optic papilla should be the first point sought and inspected; afterwards the observer may examine the adjacent parts of the retina and choroid as far forward even as the ora serrata. The papilla, fig. 113, is seen as a brilliant, well-defined, yellowish-white spot, usually circular in form, and contrasting strongly with the neighboring parts of the retina, which appear of a light pinkish color. Either in the middle of this spot, or a little to one side, are the central artery and vein of the retina, each having two branches, one ascending and the other descending, while several smaller ones extend outwardly. By looking steadily at these vessels while slight pressure is made with the finger on the ball, they will be found to move distinctly and synchronously with the pulse at the wrist.

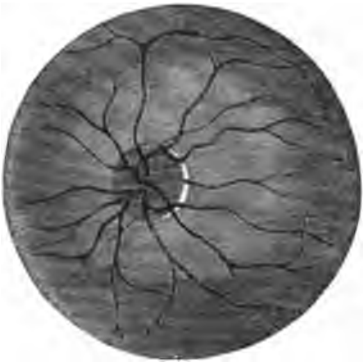
Fig. 113.



Healthy appearances of the eye.

The optic *papilla* is variously changed by disease. Among the milder affections, the most frequent is hyperemia, or congestion, the result of disease, or of excessive and long-continued fatigue of the eye, so common in seamstresses, engravers, watch-makers, proof-readers, and compositors. It is characterized by a dilated and injected condition of the vessels of the retina, which is sometimes so great as almost to conceal the papilla, as in fig. 114.

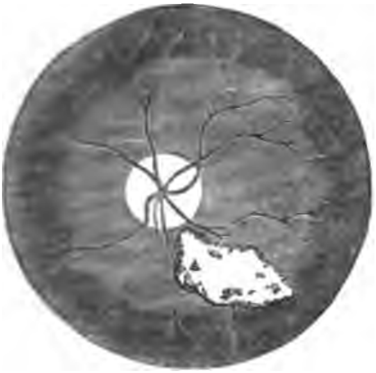
Fig. 114.



Hyperemia of the papilla.

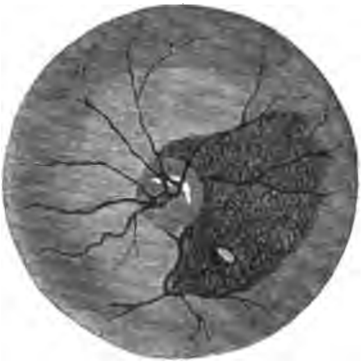
Perhaps the most important alteration which the optic papilla experiences is an umbilical depression, with perceptible pulsations of the vessels sometimes seen in glaucoma. The phenomenon, however, which is probably due to intra-ocular pressure, is usually not detected in this affection until a late period. It is occasionally conjoined with textural changes in the adjacent portion of the retina, and the papilla is then liable to lose its distinctive appearance, becoming insensibly lost in the surrounding parts. In inflammation of the retina, both this membrane and the optic papilla are preternaturally vascular, and not unfrequently the seat of plastic deposits, superficial as well as interstitial, ecchymoses, and other alterations, exhibited in figs. 115 and 116. Sometimes the retina is partially detached from the choroid by dropsical accumulations, presenting themselves in the form of bluish-white, undulating bags, projecting forwards into the vitreous humor.

Fig. 115.



Inflammatory deposits on the retina.

Fig. 116.



Extravasations of blood on the retina.

Inflammation of the *choroid*, with exudation and subsequent thinning of that membrane, and absorption of its pigment, as in the disease called posterior sclerotico-choroiditis, is characterized by the appearance of brilliant white, irregular spots, produced by the strong reflection from the sclerotica. A number of cases have recently been described in which the cellular cysticerce, a peculiar form of entozoon, was found in the retina, between this membrane and the choroid, and in the vitreous humor.

The most common pathological changes in the *vitreous humor* are liquefaction of its substance with diffused turbidness, and brownish shreds, or corpuscles, of various shapes and sizes, floating in it, mounting up into the pupil when the eye is moved, and subsiding to the bottom of the organ when it is held still. These are either masses of lymph that have been detached from the retina, choroid, or ciliary body, the remains of blood that has been poured out into the eye, or, perhaps, portions of the disorganized hyaloid membrane. These changes of the vitreous body are nearly always attended with serious disease of the retina, but it is often impossible to distinguish this membrane through the opaque substance. Such floating bodies are very readily detected by the ophthalmoscope without the aid of the lens.

The speculum is a useful means also for determining the degree of saturation of the crystalline lens in cataract and the different varieties of that disease. Incipient and slight opacities of that organ, which had entirely eluded the most careful examination with the unassisted eye, have sometimes been easily detected with this instrument. They appear as a brownish, grayish, or drab-colored veil, or as streaks across the red background of the eye. No lens is necessary in examining the crystalline body; and a weak light is preferable to a strong illumination. Its opacities are more readily detected by looking obliquely into the pupil, when they usually appear of a grayish color.

These are but a few of the pathological changes in the back part of the eye, which have already been brought to light by the ophthalmoscope. They are, however, sufficient to establish its indispensable importance in the discrimination of those numerous diseases which were formerly all grouped together under the general name of amaurosis. It need hardly be added that it requires much patience and practice with the instrument to give one that tact in the use of it so necessary to precision of diagnosis.

Ocular Inspection.—In examining this organ with the unassisted eye, with a view of ascertaining its condition, the patient should sit upon a chair, in a good light, unless there is severe inflammation, when he must sit with his back towards it. The upper lid may be gently elevated by means of the index finger, the point of which is placed against its free border, or with an instrument specially constructed for the purpose, as one of those represented in figs. 117, 118, and 119. The lower lid is easily depressed with the finger applied to the margin of the orbit, and drawing down the skin; a procedure which, at the same time, freely exposes its inner surface. Eversion of the upper lid is effected by means of a probe, director, or pencil, placed horizontally along the upper margin of the tarsal cartilage, and gently pressed against the surface, while the surgeon, standing behind or in front of the patient, raises the free margin of the lid by the cilia, with the thumb and forefinger.

Fig. 117.

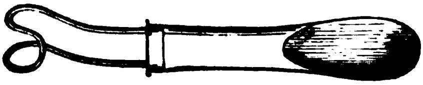


Fig. 118.

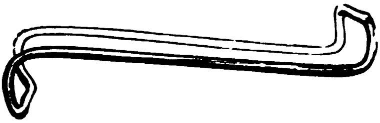
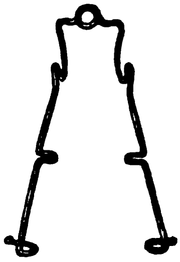


Fig. 119.



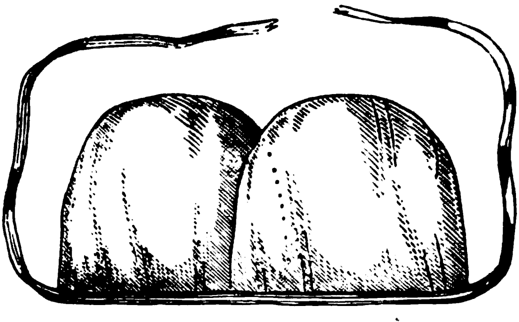
Different forms of elevators.

The observer must be careful, in his inspections, not to mistake for disease of the eye the discoloration of its tissues from the long-continued and improper use of nitrate of silver. The stain which is thus produced, and which is particularly conspicuous in the sclerotica and in the mucous lining of the lids, is of a dusky, greenish, or dirty sepia tint, and is sometimes so great as to deprive the eye not only of its natural lustre, but to cause very serious disfigurement.

When the object is to examine the interior of the eye, to ascertain the condition of the crystalline lens, vitreous humor, retina, or choroid, the pupil should previously be dilated with a solution of atropia, in the proportion of about half a grain to half an ounce of water. Of this, a few drops may be applied to the ball every thirty minutes, until the object is attained; or, instead of this, a cloth, wet with a strong solution, may be kept upon the eyelids and eyebrow for several hours. The extract of belladonna, formerly so much employed for dilating the pupil, is now seldom used for this purpose.

It is worthy of note that the topical use of atropia occasionally causes unpleasant nervous symptoms, as muscular tremors, numbness, and even delirium, as from an overdose exhibited internally. These effects, which I have seen in several instances, are generally readily relieved by an ordinary dose of morphia. The application of the extract of belladonna for dilating the pupil is also sometimes followed by bad symptoms, especially in children and very nervous persons. I have heard of two infants, laboring under congenital cataract, who were destroyed by wearing a belladonna plaster upon the forehead and temple.

Fig. 120.



Bandage for the eyes after operations.

In all cases of inflammation of the eye, and after all important operations upon this organ, the light should be carefully excluded from the patient's apartment, as the smallest quantity, falling upon the retina, generally proves hurtful. Sometimes the light requires to be merely moderated, and then the object may readily be attained by the use of a green shade, of a semilunar shape, made of a piece of thin pasteboard, covered with silk, and secured to the head by means of tapes tied at the occiput. After operations on the eye, especially those for cataract and artificial pupil, the organ must always be completely screened from the light, either by a thin handkerchief, or a particular bandage, constructed after the fashion represented in fig. 120, and fastened by several turns of a roller. Sometimes we are obliged to close the lids carefully with adhesive strips, or strips of isinglass plaster, especially after wounds of the cornea.

FOREIGN BODIES IN THE EYE.

Foreign bodies are liable to pass into the eye, and to bury themselves in its structures, where they at once become a source of suffering and inflammation. They are of various kinds, as scales of iron, bits of glass, particles of stone and coal, shot, splinters of wood, and percussion caps. Although every part of the organ may be thus injured, the cornea, from its exposed situation, is most frequently affected, the extraneous substance being either firmly imbedded in its lamellæ, lodged immediately beneath its epithelial investment, or forced into the anterior chamber, one end, perhaps, presenting externally. Great care is often necessary to discover its presence, especially when it is very minute, when it is composed of metal, or when it lies immediately in front of the pupil, the black background of which has a tendency to obscure it, so as to prevent it from being easily seen. The best way to examine the part is to stand behind the patient, as he sits upon a chair fronting the window, and then, the lids being raised, make him move the eye about in different directions, thus enabling the light to fall upon every point of its surface. In this manner no object, however minute, can possibly escape detection.

The removal of foreign bodies from the cornea requires more skill and tact than surgeons generally imagine. I have repeatedly had patients sent to me from a great distance, because the attendants were unable to afford them the necessary relief, and that, too, when the case was of the most simple nature. When the eye is much inflamed, when the substance is buried at a considerable depth, or when the patient is a child, or a very nervous, irritable, or excitable person, it will be well to exhibit chloroform before we proceed to the extraction, otherwise we shall be sure to experience serious annoyance. The upper lid being properly elevated, and the globe securely steadied by the finger, or, in the event of anæsthesia being employed, by a suitable hook, very much as in the operation for strabismus, a delicate cataract needle, or the point of a lancet, is insinuated around the foreign body, which is thus lifted out of its bed without any digging, a process which cannot be too carefully avoided, on account of its liability to be followed by severe inflammation and extensive opacity. A scale of iron that has been retained in the cornea for a few days is liable to become oxidized; hence, it may break under the instrument, and require to be extracted piecemeal. When the foreign body is firmly imbedded in the layers of the cornea, the best plan will be to make an incision over it, to its full length, with a cataract knife, and then to dislodge it with a small needle. Should it have perforated the cornea in such a manner as to render it impossible to lay hold of it with the forceps, the puncture should be enlarged until this may be safely done, care being taken, if there is danger of the substance slipping back into the anterior chamber, to make counter-pressure during the extraction by a delicate needle passed behind the cornea. All officious interference is, of course, avoided in these cases, especially rude and extensive probing, as it might prove worse than the retention of the extraneous substance.

Among the more unfortunate accidents of this kind met with in this country are lacerated wounds of the eye, made by percussion caps, which often pass through the iris into the vitreous humor, causing violent and destructive inflam-

This book is the pr
COOPER MEDICAL C

mation, followed by almost insupportable pain, lasting as long as the
body remains in the organ. I have seen more than a dozen of such
every one of which the sight was completely annihilated, and the sufferi
most violent character. If probing of the eye is ever justifiable, it is un
circumstances; and I am not certain whether the foreign substance sh
be extracted at all hazard. By putting the patient under the influence
thesia, the operation may be conducted with comparative safety, and wi
probability of success.

I have seen several bad cases of injury of the eye inflicted by small sh
in military practice it is not uncommon for the organ to be wounded by
pieces of iron, and splinters of wood. Destructive inflammation always
the lodgment of such bodies, and the rule, therefore, is to get rid of t
speedily as possible.

The question may here be asked, what should be the treatment when a
substance, lodged in the interior of the eye, cannot be extracted? Sho
humors be evacuated, or the organ itself be extirpated, as some have
mended, or should the case be managed upon general principles? Ma
the latter, unless there be great local and general suffering, or the inte
the sound eye be seriously threatened by sympathetic action, in which e
time should be lost in effecting collapse, the extraneous substance almost i
bly escaping along with the contents of the organ. As to the excision
eye, I can hardly conceive of any case, however severe, warranting so rut
procedure, as the object can always be accomplished equally well by the
operation, which has the additional advantage, in many instances, of affo
good stump for an artificial substitute.

Although dissection has shown that foreign bodies in the eye, as shot,
of iron, and percussion caps, may become encysted, yet such an event is ext
rare, and does not afford immunity against future attacks of inflammation
long, in fact, as the extraneous substance remains, it is liable at any time, w
free or adherent, to provoke suffering and disease.

Gunpowder is often imbedded in the coats of the eye, and I have seen
where it penetrated the cornea and became fixed in the lens and iris. The
accidents of this kind occur in mining and rock-blasting. Excessive pa
discomfort attend, increased by the solution of the nitre in the tears, and fol
by high inflammation. The treatment consists in picking out the gra
powder, without delay, lest the edges of the wound should close over them
so oppose their removal.

Terrible injuries are liable to be inflicted upon this organ by hot flui
water, steam, pitch, sulphur, lead, solutions of soda and soap, and also h
iron, hammered upon the anvil, the sparks flying off and forcibly striking th
The effects vary according to the temperature of the substance and the du
and violence of the contact. In the milder forms there may merely be som
coloration, or discoloration and slight vesication, with more or less pain; i
more severe, on the contrary, the part touched is either killed outright, o
tissues are so much injured as to slough from the consequences of the resu
inflammation. The indication, in these cases, is to remove any foreign m
that may be present, and then to employ antiphlogistic measures, early and
ciently, in the hope of saving structure and function. Molten lead is apt to
lect in the folds of the conjunctiva, and should therefore be sought for with
care, otherwise it may escape detection. Pitch, if firmly adherent to the
may be detached with olive oil; iron is best picked out with the point of
lancet.

Various chemical irritants, as the alkalies and acids, are capable of produ
severe injury by their contact with the eye, causing violent pain, opacity of
cornea, and excessive inflammation, often terminating in sloughing and t
blindness. The treatment of such accidents is sufficiently obvious. The
indication is to wash away with the hand or syringe as much as possible of
extraneous matter by the free use of cold or tepid water, and the second
neutralize what remains by the application of some alkaline or acid lotion, acc

ing to the nature of the substance with which the mischief was inflicted. If the eye has been touched by an acid, the most efficient remedy will be a weak solution of bicarbonate of potassa; an alkali, on the contrary, is most effectually neutralized by an acid, as a wash of vinegar and water, aided, if necessary, by the vapor of hydrochloric acid. The eye, in either event, should be bathed for a long time after the extraneous substance has been dislodged, and then well anointed with olive oil, a full anodyne being used to allay pain, and leeches to moderate inflammation.

Nitrate of silver, too freely put upon the eye, whether accidentally or designedly, is readily neutralized by a weak solution of common salt, followed by the application of the raw white of an egg.

Quicklime, or oxide of calcium, speedily destroys the structures of the eye, by inflicting a double injury by its chemical action and by the evolution of heat under the influence of the tears and mucus. The foreign matter being picked away, the organ should be promptly syringed with a weak solution of vinegar and water, and then thoroughly coated with oil. It was formerly imagined that sugared water, freely used as a wash, would rapidly neutralize the lime under such circumstances, by forming a removable soluble compound, but observation has proved this notion to be erroneous.

DISPLACEMENT OF THE BALL OF THE EYE.

Displacement of the globe of the eye, technically called exophthalmos, may be produced by various causes, of which the most common are different morbid growths in and around the orbit. A mass of fat or an exostosis, by filling up the bottom of this cavity, may thrust the eye forwards, out of its natural position, and even force it out upon the cheek, completely beyond the lids. Similar effects are sometimes caused by polyps of the nose, by tumors of the maxillary sinus, and by morbid growths at the base of the brain. When the displacement is very great, so that the optic nerve is put much upon the stretch, as well as compressed, dimness of sight, if not total blindness, is apt to ensue. When the dislocation is the result of an accumulation of fat in the orbit, it may affect both organs simultaneously, as in the following case, which fell under my observation in 1848:—

Powtan, a black boy, twelve years old, tall and slender, has had a remarkable protrusion of both eyes ever since he was two years old. At present, the balls hang, as it were, from their orbits, projecting nearly half an inch beyond the level of the nose, which, however, is rather flat. They preserve their natural direction, but cannot be moved about, and they do not appear to be at all enlarged or hypertrophied. The sight is unimpaired. The upper lids are remarkably full towards the eyebrows, and are one inch and a half in the vertical direction, by two inches and a quarter in the transverse. Notwithstanding this inordinate development, they are insufficient to cover the ball of the eye completely. The lower lid is about the natural size. The right cornea, at its inferior part, has an opaque spot upon it, and the pupil has the appearance of having been injured, being vertically elongated. The orbits do not seem to contain any hard substance or tumor, as the finger may be pushed into them some distance between the brow and the upper part of the ball. The boy has occasionally had neuralgic pains in the eyes, with lachrymation, but in other respects he has been free from suffering. His general health is good. The protrusion has been stationary for some time past.

By a singular coincidence, this boy died, while under my care, of gastritis, thus affording me an opportunity of examining his eyes by dissection. Upon removing the contents of the orbits, I found the cause of the protrusion to be an accumulation of fat behind each ball, within the muscles; it was of a yellowish color, and rather more firm than common. The ball rested upon it as in a cup. The optic nerves were normal, but apparently somewhat longer than usual. The straight muscles of the right eye were larger than those of the left. The lachrymal glands were forced considerably forward, but were of the natural size, color, and structure. The inner wall of the orbit, especially the left, was more prominent than common, but had no agency in producing the protr Both eyes were perfectly sound.

An abscess, seated deeply within the orbit, may occasion serious displac of the eye. A case of this kind has been related by Professor Arlt, of V in a child only fifteen days old. The protrusion of the ball was accompani great œdema of the lids, and was promptly relieved by the evacuation of spoonful of thick pus.

A partial displacement of the eye is sometimes caused, at least, appar by an elongated and relaxed state of the straight muscles. This affection, always imparts a disagreeable expression to the features, is most comm weak, hysterical females, and demands a tonic, invigorating course of treat

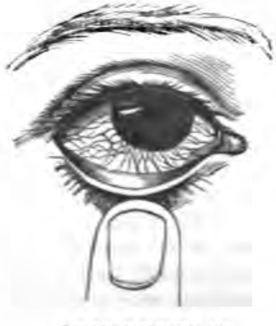
The eye is occasionally dislocated from its socket by external violen have never met with such a case in the human subject, but once saw a poodle, which, in a fight with a large mastiff, only half an hour previousl the misfortune to suffer from this accident. The eye hung completely out the cheek merely by the optic nerve, without any injury to the ball, but great stretching of the different muscles, two of which were torn nearly e across. The displacement had evidently been produced by the canine t the mastiff. The eye was restored without any difficulty, and the animal a rapid recovery, without the slightest apparent impairment of vision. Alt I had expected, in this instance, merely to visit the lady, and not her p never shall forget the interest which the case afforded me, and with what pl I watched its progress.

DISEASES OF THE CONJUNCTIVA.

Inflammation.—The conjunctiva is the seat of various forms of inflamm known by the generic term ophthalmia, assigned to them long ago by w on the eye and still generally recognized by authors. There is no class eases whose nomenclature has been more uselessly encumbered with unme epithets than this. There is an array here of names well calculated to any one, even the most courageous; the conjunctivitises are, in fact, a endless. Thus we have the simple, catarrhal, idiopathic, traumatic, pus aphthous, purulent, gonorrhœal, granular, strumous, exanthematous, and e many besides.

1. *Simple Inflammation.*—The most simple form of conjunctivitis, as w the most common and easily managed, is that which results from the sup sion of the cutaneous perspiration, exposure of the eye to intense ligh lodgment of a foreign body, disorder of the digestive apparatus, or, in from any slight, common, and transient cause, whether operating directly the eye itself, or indirectly through the general system. The symptoms de of the morbid action are abnormal redness of the conjunctiva, pain, lachrym and intolerance of light, with a slight dis of mucus, barely sufficient, perhaps, to glu lids gently together in the morning or after hours' sleep. The vessels, as seen in fig. 12 small, tortuous, and few in number. There tumefaction of the lids, no involvement of cornea, iris, or sclerotica, and no purulent s tion. In a word, the inflammation is of the simple nature, and, unless neglected or managed, generally disappears in from tw three days, at farthest, the eye rapidly regai its natural characters and functions.

Fig. 121.



Simple conjunctivitis.

An inflammation like this, however, ma consequence of mismanagement or a continu of the operation of the exciting cause, beco much more serious affair, and in the end be ductive of extensive structural mischief. The discoloration will then be more diffused, the conjunctiva exhibiting a uniform scarlet or bloodshot appearance; and there will be excessive lachrymation, great increase of pain, severe intolerance of light, a muco-purulent discharge, more or less profuse and glutinous, and involvement of some of the other structures of the eye.

The *redness* of conjunctivitis is peculiar, not only in the milder and more common forms of the disease, but in every other. It is of a scarlet hue, and may occur either in circumscribed spots, or, as is more generally the case, be diffused over the whole anterior surface of the ball, except the cornea, according to the extent of the inflammation; very generally it affects also the inner surface of the lids, and it may even be greater there than elsewhere. It is seated exclusively in the conjunctiva and ocular fascia, or in the conjunctiva and the subjacent cellular tissue, and is usually most conspicuous where the membrane is reflected from the lids over the sclerotica. The arrangement of the vessels is also peculiar. They are spread out arborescently, and are perfectly movable, tortuous, and remarkably distinct, hundreds being visible in every direction, where in the natural state there is hardly one. As the disease augments in intensity, the vessels are, as it were, lost, the inflamed surface exhibiting a uniform scarlet appearance.

There is a great difference between the redness of conjunctivitis and the discoloration of sclerotitis, and, as the subject is one of much practical importance, it cannot receive too much attention. In the former, the color of the inflamed surface is scarlet, especially if the disease has made considerable progress; in the latter, on the contrary, it is pink or lilac, the reddish hue contrasting beautifully with the naturally bluish tint of the fibrous structure; in the one it is superficial and movable, in the other deep and fixed. In conjunctivitis, the vessels are large and ramiform, anastomosing with each other in every conceivable direction; in sclerotitis, they are very small, and disposed longitudinally, running from behind forwards in parallel lines towards the cornea, where they form a distinct zone, often extending completely round the eye. In violent conjunctivitis, all trace of vessel is lost; in sclerotitis, on the contrary, they always remain distinct, however severe the attack. A little attention to this subject will soon familiarize the young surgeon with these characteristics, and enable him without difficulty to form a correct diagnosis between two affections requiring such opposite modes of treatment.

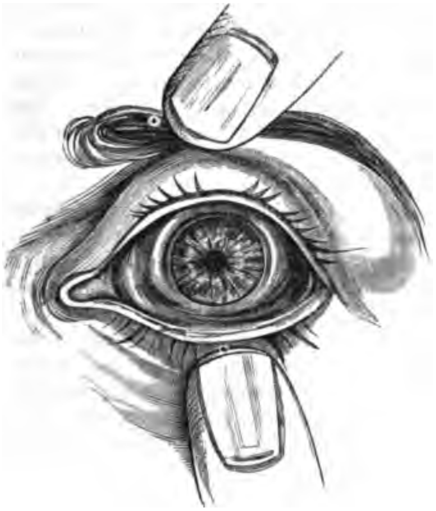
The *pain* in conjunctivitis is seldom severe, except in the more violent forms, when it is often exquisite. In general, there is merely a sense of uneasiness, or a feeling as if there were a particle of foreign substance in the eye; an occurrence due to the distended state of the vessels. The uneasiness, pain, or aching is steady, but liable to vesperal exacerbations and remissions, and confined mainly to the site of the disease. In sclerotitis, it is severe, deep-seated, paroxysmal, and circumorbital, generally affecting the temple, cheek, and forehead.

The *lachrymation* is often considerable, even in the milder forms of conjunctivitis; the tears are hot and scalding, and often gush out in a full stream the moment the lids are separated. The flow may continue profusely for an indefinite period, but in general it lasts only a few days, when it sensibly diminishes, and soon after entirely disappears, especially if there is much muco-purulent secretion, a plentiful discharge of tears and matter seldom coexisting for any length of time.

The *intolerance of light* varies; sometimes it is quite insignificant, at other times excessive. In general, however, it is an important symptom, for there is hardly a case of ophthalmia where there is not more or less of it. In the strumous variety it is characteristic, and is often so intense as to induce the sufferer to bury his face in the bedclothes, or, if he is a child, in his nurse's lap.

Much difference also obtains in regard to the *discharge* of mucus, pus, or muco-purulent matter. In the more simple cases, there is usually only a slight increase of the natural secretion; but if the disease is at all severe, the discharge will be abundant, thick, glutinous, and of a decidedly muco-purulent nature. Indeed, there are certain varieties of ophthalmia which derive their distinctive features from the character of the secretion of the inflamed surface; as, for example, in purulent and gonorrhœal conjunctivitis. The Meibomian glands, participating in the inflammation, also furnish an abundant secretion, of a peculiarly viscid nature, which, mingling with that derived from the mucous membrane, causes the agglutination of the edges of the lids, so common and so annoying in the more severe forms of conjunctivitis. In sclerotitis and corneitis, the discharge of mucus is generally trifling, while the formation of pus is a comparatively rare occurrence.

Fig. 122.



Chemosis, or swelling of the conjunctiva.

Tumefaction of the conjunctiva is present only in some cases, and is dependent, not upon any marked distension of the membrane itself, but upon the infiltration of the subjacent cellular tissue, commonly known at the present day as the ocular fascia, a structure which, I believe, I was the first to describe, in 1839, and which plays so important a part in all the more violent forms of conjunctivitis. Possessed of great laxity, this texture admits of extraordinary distension with serum, or sero-plastic matter, giving rise to the state called *chemosis*, fig. 122, and which is so frequent a source of sloughing of the cornea. When the tumefaction exists in its worst degree, it forms a kind of rim around the cornea, often several lines in depth, causing the front of the ball to have a cup-shaped appearance. Much swelling is also frequently present at the inner canthus, and at the point of reflection of the conjunctiva from the lids over the sclerotica. It is worthy of note that this symptom is entirely absent in sclerotitis and corneitis, as well as in the more deep-seated inflammations of the eye.

Swelling of the lids is rarely present in simple conjunctivitis, or even in many of the more severe cases; in purulent and gonorrhœal ophthalmia, on the contrary, it forms a conspicuous and troublesome symptom, greatly increasing the local suffering, as well as materially interfering with the examination and medication of the eye. In this respect again, conjunctivitis differs remarkably and characteristically from sclerotitis and corneitis, in which the lids are either not swollen at all, or only very slightly.

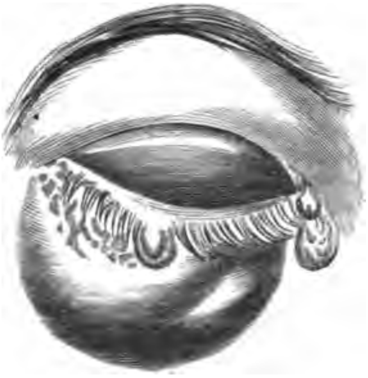
2. *Diphtheritic Inflammation.*—Under this appellation, Von Graefe has described a form of external ophthalmia whose characteristic feature is a deposit of lymph in the subconjunctival cellular tissue both of the ball and of the lids. The affection, which may be either sporadic or epidemic, is most common in children under three years of age, is sometimes, if, indeed, not generally, contagious, and is often associated with diphtheritic inflammation in other parts of the body. Both eyes are usually involved. Infants are exempt from the disease, as their blood does not seem to be capable of furnishing plastic matter.

The exudation in diphtheritic inflammation is situated in the cellular layer beneath the conjunctiva; consequently, this membrane is always considerably elevated, the cornea lying, as it were, in a hollow, while the lids are greatly thickened, stiff, inelastic, and immovable. Sometimes, but rarely, lymph is also found upon the surface of the conjunctiva. The tumid part is smooth, and of a pale yellowish, cineritious, or reddish-white hue, and remarkably firm in its consistence. The circulation is greatly embarrassed, the superficial vessels are enlarged, and numerous apoplectic specks are observable, denotive of mechanical obstruction and rupture. In the more advanced stages of the disease, indeed, hardly any vessels are visible, and these exhibit the appearance rather of broken canals than of ordinary vascular tubes. If the part be incised neither blood nor lymph escapes from the indurated structures.

The symptoms are usually very distressing. Photophobia is present in greater or less degree. The heat is very intense, as is shown both by the touch, and by the rapid evaporation of fluid applications. The pain is very great, even at the beginning, and the conjunctiva is so sensitive as to be intolerant of the slightest manipulation. Considerable lachrymation commonly exists, and the accompanying discharge, seldom copious, is of a yellowish or dirty grayish color. Gradually, as the action progresses, the cornea becomes opaque, ulcerated, and, finally, if relief is not afforded, gangrenous, from the strangulation of its vessels. Large portions of the ocular conjunctiva are sometimes involved in the slough. The patient is feverish and restless; the disease rapid and grave. In the worst forms of the affection, the sight and even the eye itself may be destroyed in twenty-four hours from the time of its first appearance.

3. *Purulent Inflammation.*—Purulent ophthalmia derives its characteristic features from the nature of the attendant discharge, which is generally excessively profuse, thick, viscid, and irritating; it sets in within a few hours after the attack, and continues steadily until the disease disappears. It occurs in all parts of the world, particularly in the warmer latitudes, where it is often epidemic. Sporadic cases are constantly met with everywhere. It is most common among the humbler classes, and seems to be caused by atmospheric vicissitudes. The matter which is so profusely secreted is contagious, and, consequently, capable of communicating the disease by actual contact or inoculation. The inflammation is of the most vehement character, being accompanied by the most atrocious pain, swelling, discharge, and intolerance of light; the lids, as seen in fig. 123, are enormously distended; the conjunctiva is profoundly chemosed; and the cornea, buried almost out of sight, becomes speedily opaque, and finally sloughs, vision being irretrievably destroyed. Of the frightful character of this distemper, when it prevails as an epidemic, some conception may be formed when it is stated that the Chelsea and Kilmainham hospitals contained at one time, soon after the return of the British troops from Egypt, 2317 soldiers who were totally blind from its effects. The case of the ship Rodeur, a French slaver, affords a good illustration of the manner in which the disease spreads under circumstances of the atmosphere favorable to its propagation. Of the blacks, 160 in number, among whom it first broke out fifteen days after their departure from the coast of Africa, 39 of those who survived were totally blind, 12 lost each an eye, and 14 had corneal opacity. Of the crew, consisting of 25 persons, only 1 escaped, and he was attacked soon after he landed at Guadaloupe. It is asserted that 30,000 cases of this disease occurred in the Prussian army, from 1813 to 1821; and the Belgian army, it would seem, has suffered still more extensively.

Fig. 123.

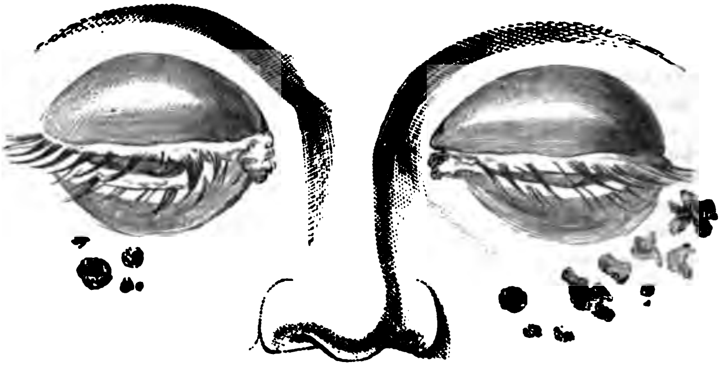


Acute purulent ophthalmia.

Purulent ophthalmia occasionally occurs in the *infant* within a few days after birth, in consequence, as has frequently been supposed, of inoculation with gonorrhœal or leucorrhœal matter derived from the mother at the time of birth. That such a thing is possible is unquestionable, for multiplied observation has fully established the fact; but that it is generally, or even frequently, the cause of the disease, is certainly not true. Of the numerous cases that I have seen of it, I have never been able to trace a solitary one to the effects of inoculation of any kind, notwithstanding the most minute and circumstantial inquiry into their history. The mothers in all were beyond the reach of suspicion, as it respected

their chastity, and, as far as could be ascertained, perfectly truthful. My conviction is that the disease, as it usually appears, is of atmospheric origin, depending upon the same causes as the purulent ophthalmia of adults, and that it is, therefore, wholly free from specific poison, although, perhaps, capable of being communicated by inoculation. However this may be, it is characterized by an abundant discharge of a thick, yellowish pus, great redness of the conjunctiva, and so much swelling of the lids as to render it extremely difficult, if not impossible, to separate them, so as to get anything like a fair view of the cornea, which is often early involved in the disease. These appearances are well seen in fig. 124. The most healthy children, as well as the most puny, are subject to this disease, the former, according to my experience, suffering more frequently than the latter; it generally runs a rapid course, and, unless properly managed, often eventuates in total blindness, especially when, as usually happens, both eyes are affected.

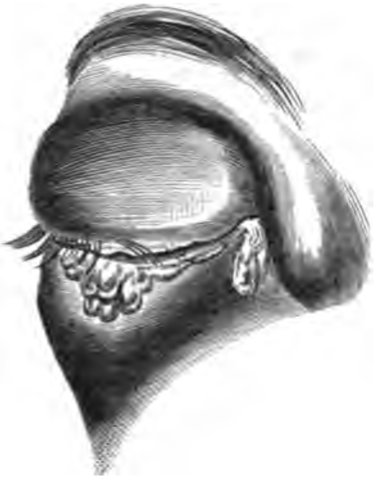
Fig. 124.



Purulent ophthalmia in the newly-born infant.

4. *Gonorrhœal Ophthalmia.*—This disease is produced by the contact of gonorrhœal matter. It is a most virulent form of inflammation, spreading with great rapidity from the conjunctiva to the other structures of the eye, which is usually completely destroyed in a few days. Its principal phenomena are excessive discoloration, and swelling of the conjunctiva and of the lids, profuse muco-purulent discharge, of a yellowish and very viscid character, great pain, lachrymation, and intolerance of light, and early opacity of the cornea, which soon dies and sloughs, thus permitting the escape of the humors with the consequent collapse of the eye, as in fig. 125. Positive inoculation is necessary to the production of this disease; I have never seen an instance where it showed itself as a secondary affection, and I strongly question the possibility of such an occurrence, notwithstanding the many apparent proofs that have been adduced in its support. The disease usually begins in one eye, but in most cases the other becomes also involved from the accidental contact of the matter.

Fig. 125.



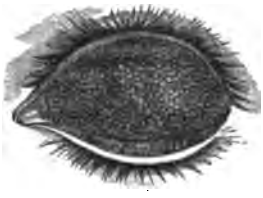
State of the lids in gonorrhœal ophthalmia.

There is something very curious about this disease, which has not yet been

satisfactorily elucidated. If gonorrhœal ophthalmia is really an entity, why is it that it does not occur more frequently, for there are thousands of persons, ignorant and filthy, who, while laboring under specific urethritis, constantly carry their fingers, besmeared with matter, to the eye, often rubbing and scratching it, and yet do not contract the disease? May we infer from this that it is difficult of propagation, or that it can only be produced in this way in some individuals, and not in others? Authors constantly adduce cases in which this variety of ophthalmia is said to have been induced by the contact of the patient's urine, employed for bathing the eye, under the popular belief that it is a good and speedy cure for the disease. Now, is this possible? Does not this admixture of the two fluids effectually destroy the specific poison of gonorrhœa? Could the matter of smallpox, chancre, and other diseases withstand the neutralizing influence of so acrid and readily-decomposed a fluid as the urine? These questions afford food for reflection, and should, if possible, be settled before we receive as true all that has been written upon the subject. This is the more necessary, because it is well known that the ordinary, non-specific form of purulent ophthalmia often destroys the eye completely in less than three days after its outbreak. Meantime, the only evidence that the disease is of a gonorrhœal nature is derived from its history; that is, we cannot be certain that the affection of the eye is specific, unless we know that the patient is laboring under specific urethritis. Such a diagnosis is, to say the least, not very philosophical, for it may well be asked whether it is not possible for a non-specific but destructive inflammation of the eye to take place during the progress of an ordinary gonorrhœa, and yet be entirely independent of it? As for myself, I can readily conceive of such an occurrence, although, granting all that might be said respecting it, it would be very natural to view the two affections in the light of cause and effect.

5. *Granular Inflammation.*—The lids are occasionally the seat of a villous condition of the conjunctiva, liable to degenerate into little bodies, which, from their resemblance to the structures observed upon a healing ulcer, are denominated granulations, and which are well seen in fig. 126. These bodies, which are nothing but enlarged villi, found in such abundance upon nearly all mucous surfaces, are never present in ordinary conjunctivitis, while they are exceedingly common in certain varieties of that disease, especially such as are attended with purulent discharge, often forming in an almost incredibly short time. They are always most abundant upon the upper lid, where they are frequently extremely large and numerous, giving the mucous surface a rough, mammillated appearance, not unlike that of a strawberry; they are of a deep red color, and usually occur in groups, which are often separated by well-marked fissures. Similar bodies are generally met with on the lachrymal caruncle, though seldom in large numbers. On the lower lid they are always comparatively small, and more straggling than on the upper.

Fig. 126.



Granular lid.

In the Southwest, where these granulations are extremely common, I often saw them form in immense numbers, and of extraordinary size, in less than forty-eight hours from the commencement of the disease. In some regions of that country, especially in the Wabash Valley of Indiana, and some parts of Illinois, Kentucky, and Mississippi, the disease is occasionally epidemic. Boatmen on the Ohio, Mississippi, and other rivers are remarkably prone to its attacks. During my residence at Louisville, I treated large numbers of cases of this kind, and other cities, as St. Louis, Memphis, New Orleans, and Chicago, have always had a full share of them. The malady was much more common in men than in women, and in young and middle-aged subjects, than in children and old persons, and it appeared to me to be often of a miasmatic origin. However this may be, it is certainly most frequent in those regions of the Southwest where neuralgia and intermittent fever are most prevalent. Persons who sleep

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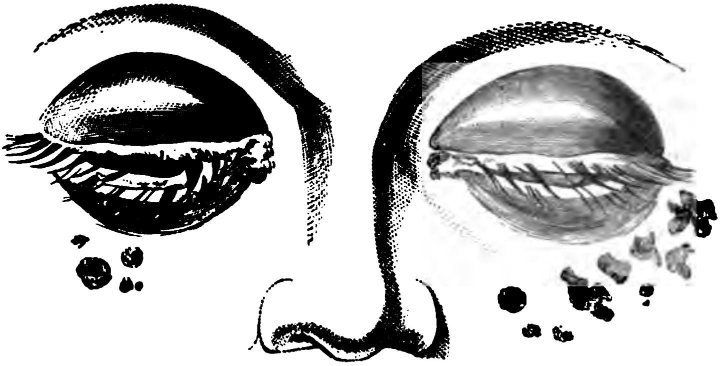

Purulent ophthalmia in the newly-born infant.

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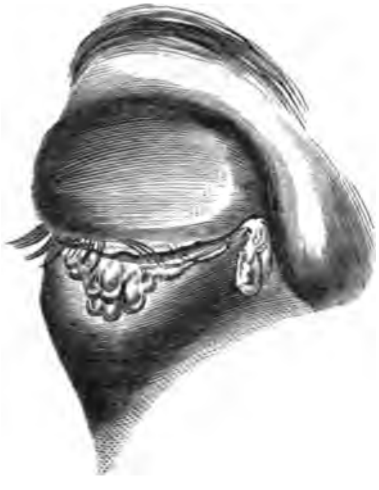
Fig. 125.



State of the lids in gonorrhœal ophthalmia.

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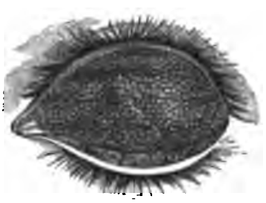

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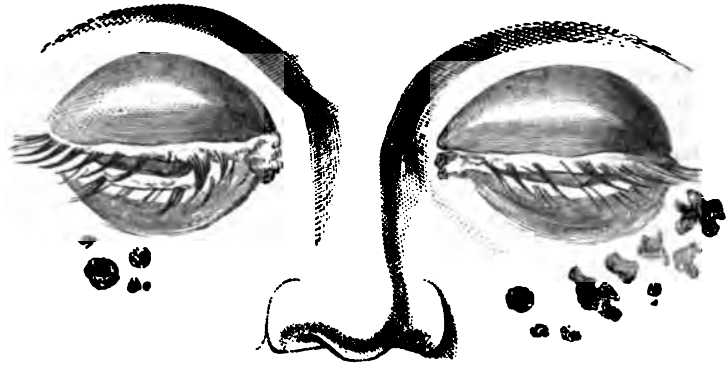

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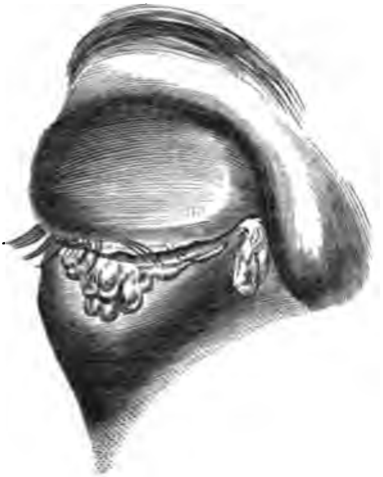

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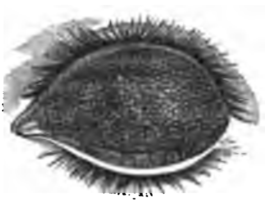

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out in the open air, or who travel much at night, are particularly liable to its attacks.

The disease is always attended with a profuse discharge of thick, viscid, yellowish pus, and with the other phenomena of the more violent forms of conjunctivitis. From the friction which the granulations constantly exert upon the ball, the cornea is soon involved in interstitial deposits, and is thus often rendered completely unfit for the purposes of vision. As this peculiar state of the lids can only be ascertained by a careful examination of their inner surface, they should always be thoroughly everted whenever there is the slightest purulent discharge, leading to a suspicion of its existence. An immense number of cases have come under my observation where total blindness was produced by this disease, without the attending physician having ever inspected the parts, or known what the real nature of the affection was.

As to strumous ophthalmia, the consideration of such a disease would evidently be misplaced among the inflammations of the conjunctiva; it is an affection of the whole eye and of the constitution at large, and must, therefore, be brought in under another head.

Treatment.—In the treatment of conjunctivitis, even of the more severe varieties, the practitioner must constantly divest his mind of the idea of specifics; he must recollect that the affected structure is mucous in its character, and that the disease, except in its milder grades and forms, will speedily extend to the adjoining parts, involving them in mischief, if not in irreparable ruin. He must be particularly upon the alert when the inflammation is attended with muco-purulent discharge, great swelling of the lids, chemosis, and atrocious pains; for, under such circumstances, there is great danger of serious involvement of the other tunics of the eye, particularly of the cornea, the slightest opacity of which always awakens the most painful apprehensions on the part of the experienced surgeon for the safety of the affected organ. Any such appearance should put us upon our guard respecting the prognosis of the case, while it should induce us to redouble our efforts to arrest the morbid action. An examination of the eye should not be made oftener than is absolutely necessary to observe its condition, but such information should not be neglected on any account, although it may be obliged to be obtained at the expense of considerable suffering.

The milder forms of conjunctivitis generally yield to very simple treatment. Confinement in a dark room for a short time, light diet, an active purge, and tepid, cool, or cold bathing of the eye, with, perhaps, a Dover's powder at bedtime, constitute the most appropriate remedies. When the inflammation is more violent, or disposed to be somewhat obstinate, the list may be increased by the addition of the antimonial and saline mixture, with greater restriction of the diet, and the abstraction of blood from the neighborhood of the affected tissues by leeching or cupping. Depletion by the lancet can be required only when the patient is plethoric and the inflammation intense. Under such circumstances the surgeon never hesitates to take blood freely, drawing it from a large orifice in a bold and rapid stream, just as we do in any other inflammation threatening loss of structure and function. Judging from the remarks of some recent ophthalmic writers respecting general bleeding in diseases of the eye, one would suppose that they considered this organ as forming a sort of system by itself, not governed by the ordinary laws of the economy. I am certainly not inclined to carry the operation so far as some practitioners, who, according to their own reports, have occasionally reduced their patients to the very verge of the grave by it, draining them to almost complete anemia, or until the countenance was of a deadly, waxen, pallid appearance, and the poor sufferer could hardly raise his head off the pillow. Such a course is quite as censurable as the opposite. One good, thorough bleeding, at the commencement of the disease, while the patient is in the semi-erect posture, will often cut short an attack, which, without such a measure, might eventuate in the destruction of the eye, or, at all events, in great suffering and more or less impairment of sight. The same rules that are applicable to bleeding in other diseases are applicable to this. The robust countryman will bear the loss of blood much better than the man who lives in a crowded city, who is the inmate of an ill-ventilated hospital, or who has spent half his time in intemperance and dissipation. The extremes of life, the state of the system, and the nature of the attack, must all be taken into the account. When general bleeding is contra-indicated, blood may nearly always be taken, with great advantage, by leeching and cupping, practised early and efficiently, but not indiscriminately and causelessly.

Among the more important remedies in the different forms of conjunctivitis cathartics hold a prominent rank; unless there is some positive contra-indication, they should partake somewhat of a drastic character, so that they may produce both a derivative and purgative effect. They should be given early and late in the disease, with proper regard, of course, to the strength of the patient and the state of the intestinal mucous membrane. Among the more appropriate articles are senna and Epsom salts, jalap and cream of tartar, and the compound calomel pill. When decided evidence of gastric disorder exists, the use of the purgative may be preceded by the exhibition of an emetic. Vomiting, however, is only admissible so long as there is no tendency to disorganization of the eye; for, when this is present, the concussion which it would cause could hardly fail to prove injurious. Nauseants must be used more or less freely in all stages of the inflammation; either in the form of the antimonial and saline mixture, or in that of solution of tartar emetic and morphia; the dose and the frequency of its repetition being regulated by the exigencies of each particular case. Mercury is now rarely given in any form of conjunctivitis, whatever may be its degree or character, experience having shown that it is destitute of controlling power. It is only when there is much disorder of the secretions that it should be thought of in connection with the disease. Anodynes must be administered freely, whenever there is much local suffering, or inability to sleep, at every stage of the malady, and in all classes of subjects, unless there are strong and decided contra-indications; for, besides answering these important purposes, they usually prove of immense benefit in affording quietude to the affected organ, an object of such great consequence in the treatment of inflammation generally. Elevation of the head and exclusion of the light will, of course, receive due attention.

Locally, none but the mildest remedies should be employed. It is a great mistake, yet one which is constantly committed even by men otherwise experienced, to use strong applications to the eye in every form and stage of the inflammation. Nothing can be more erroneous and unscientific, and, consequently, more prejudicial to the parts, than such a procedure. How often have I seen the simplest conjunctivitis, which in a few days might have disappeared spontaneously, converted into a most violent, obstinate, and protracted disease by the untimely use of a collyrium! If a collyrium is admissible at all, it is only, as a general rule, after the morbid action has been, in some degree, subjugated by other means, when it has assumed a subacute character, or when it is about to become chronic; in ordinary cases, I generally dispense with such applications altogether. When the symptoms are very urgent and threatening, I sometimes depart from this rule, but even then usually not without regret. In the purulent and gonorrhœal varieties of the affection, most ophthalmic surgeons urge the employment of strong collyria, even at an early stage of the attack, on the ground, as is alleged, of their beneficial effects in controlling inflammation. I have used them myself in such cases, but seldom without doubt and misgiving, if not a positive conviction of their injurious effects. I feel as if I could hardly inveigh too forcibly against this practice, knowing, from sad experience, what an immense amount of mischief it may do.

The most valuable articles of this class of remedies are the different preparations of lead and zinc, wine of opium, and nitrate of silver, the latter of which is at once the most potent and the most abused. The lead or zinc may each be used in the form of solution, in the proportion of one, two, or three grains of the salt to the ounce of distilled water, a few drops being poured upon the inflamed surface twice or thrice in the twenty-four hours. If the application smart beyond a few minutes, it must be weakened, or employed less frequently. The best preparation of opium is Sydenham's laudanum—the wine of opium of the shops—diluted with three or four parts of water, or dropped upon the eye in a pure state. The strength of the nitrate of silver should vary from the eighth of a grain to two grains for the more ordinary cases, while in the more violent it may range from five to sixty. When the solution is very strong, it should be applied by means of a camel-hair pencil, the inflamed surface having previously been dried with a soft linen rag. When the lids also suffer, the best plan is to touch them and not the ball, their return to their natural position serving to diffuse the caustic over the whole of the diseased structure. Whatever collyrium be used, its effects must be carefully watched, and whenever they are found to flag, another must take its place. Solid nitrate of silver ought seldom to be used about the eye.

In the more severe cases of conjunctivitis, the patient will derive great comfort from poppy fomentations, cloths wrung out of warm water and opium, and the application of medicated steam, directed upon the eye by means of an inverted funnel. Sometimes a light poultice is very soothing, especially when the surface is wet with laudanum, or laudanum and acetate of lead.

The treatment of *diphtheritic* ophthalmia must be prompt and decisive. The constitutional remedies must be employed with great vigor; the patient must be confined in a dark room, and blood must be taken either from the arm, or by leeches from the forehead, cheeks, lids, and temples. The most reliable topical means are early and free scarifications of the swollen conjunctiva, followed by the thorough application of the solid nitrate of silver, repeated, in the more severe forms of the disease, at least twice in the twenty-four hours. The redundant salt should be washed away after each application with the sponge or syringe. The incisions should extend down to the surface of the sclerotica, otherwise it will be almost impossible to prevent opacity and sloughing of the cornea. When the lids are very stiff, glossy, and tumid, from serous and plastic deposits, great benefit will accrue from external punctures and incisions, and also, in many cases, from the use of blisters and tincture of iodine.

In *purulent*, gonorrhœal, and other forms of ophthalmia, attended with unusual swelling and a rapid extension of the morbid action, the most appropriate measures are, free incisions of the outer surface of the lids, extensive scarification of the chemosed conjunctiva, and the injection of the eye, every half hour, with a solution of opium and bichloride of mercury, in the proportion of two grains of the former and one-eighth of a grain of the latter to the ounce of tepid water. If the discharge of pus is very profuse, the inner surface of the lower lid may be pencilled over twice a day with a strong solution of nitrate of silver. The bichloride of mercury is a remedy of great potency in all cases attended with copious puriform deposit. When the lids are enormously swollen I have found great benefit from the application to them of a large blister, the surface being well protected with gauze, to prevent the fly from falling into the eye. The use of the syringe I regard as of paramount importance in these cases, as it is the only means by which we can obtain clearance of the irritating matter, and effectually medicate the inflamed surface.

In the purulent ophthalmia of *infancy*, I have usually effected excellent, and even rapid, cures, by the injection every few hours of tepid water, or milk and water, followed immediately after by a solution of bichloride of mercury, from the eighth to the twelfth of a grain to the ounce of water, and the constant application of a light elm poultice, medicated with acetate of lead, and frequently renewed. Internally, we may give, every eight hours, a minute quantity of Dover's powder, with the twelfth of a grain of calomel, or the same quantity of calomel and ipecacuanha, to act upon the skin, to allay pain, and to quiet the diseased structures. The bichloride of mercury is, of all the local remedies that I have ever tried in this affection, the most efficacious in its action, making generally a most rapid and decided impression upon the discharge. Very weak solutions of lead, zinc, and alum are also beneficial, but altogether inferior to the bichloride. When the eye is unusually irritable and sensitive to light, the addition of a small quantity of belladonna to the collyrium will commonly be highly advantageous. One of the great points in the treatment of this and other forms of purulent ophthalmia, is to get rid of the acrid secretions, which, if allowed to remain, always act as local irritants. As to leeches and counter-irritation, I rarely employ them in this disease as it occurs in infancy.

If the child is feeble, a minute quantity of quinine is given three or four times a day, and in all cases proper care is taken that it obtain a sufficiency of good nourishment from the mother. As the disease improves, exercise in the open air is enjoined.

It is often very difficult to obtain a satisfactory view of the condition of the eye in this affection, owing, as before stated, to the excessive tumefaction of the lids. The proper way to accomplish this object is to place the child's head between the knees, and then to draw the lids gently apart with the index fingers, no attempt being made at eversion, which, under such circumstances, is quite impossible. The eye should always be well syringed the moment before the examination, to prevent the matter from obscuring the ball.

In regard to *granular* conjunctivitis, the practice of ophthalmic surgeons has hitherto been eminently uncertain, if not empirical. Without detailing what others have said upon the subject, I shall content myself with giving an outline of the treatment which I have myself usually found most efficacious, premising that I have seen many hundred cases of the disease, in all its gradations, from the mildest to the severest, from the most transient to the most protracted and rebellious.

The first thing that should claim our attention is the state of the general health, which is often seriously deranged, in consequence of the joint agency of disease, confinement, and ill-treatment. Purgatives are generally indicated, and often afford immense relief; the diet must be carefully regulated; exercise must be interdicted; and, if there is much pain, interfering with sleep, a full anodyne must be administered at night, either by itself or along with a diaphoretic, or a drachm of the wine of colchicum, the latter being particularly serviceable when the pain is of a rheumatic character, or diffused over the side of the head. If the patient is plethoric, the antimonial and saline mixture must be given three or four times a day, along with a small quantity of morphia in each dose. When the cutaneous surface is at fault, Dover's powder is an excellent remedy, administered every night towards bedtime in doses of fifteen or twenty grains, and, under similar circumstances, a tepid salt bath is sometimes useful. The bowels must be moved by medicine regularly every fourth day, for I consider systematic and thorough purgation as of paramount importance. The diet must be light and farinaceous, without being too nutritious. The only form of counter-irritation which I have of late years employed is the seton, introduced into the corresponding arm, or into both limbs, if the disease involve both eyes.

Dr. C. S. Fenner, of Memphis, has used, with great advantage, in this complaint, a strong decoction of phytolacca, given in wineglassful doses every two or three hours until it causes pretty active purgation, when it is administered in smaller quantity or at longer intervals. It is considered to be particularly valuable in the rheumatic form of the malady, attended with severe pain in and around the eye.

If the granulations are very large and exuberant, I shave them off with a sharp scalpel close down to the conjunctiva, without including this membrane in the operation; and, having encouraged the flow of blood as long as possible with a sponge and tepid water, I immediately cauterize the raw surface with a stick of sulphate of copper, expressly prepared for the purpose. The part, being again exposed to a stream of water, to remove the redundant salt, is permitted to resume its natural position: the patient is directed to bathe the eye frequently for the next two days, and to anoint the edges of the lids at night with a little thick cream or fresh lard. If, on the other hand, the granulations are comparatively insignificant, I dispense with the use of the knife, and resort at once to the application of the copper. This should be repeated every third or fourth day, care being taken always to dry the surface previously with a soft rag, and to wash off the redundant salt. The copper is never applied directly to the ball or lower lid, as that on the upper lid soon diffuses itself over the whole of the inflamed surface. In the intervals of the cauterization, the eye is bathed, more or less frequently, with cool, tepid, or cold water, simple, mucilaginous, or slightly astringent, as may be most agreeable to the part and system, or favorable to the reduction of the morbid action.

Instead of the copper, I sometimes use a strong solution of nitrate of silver, twenty, thirty, or even sixty grains to the ounce of water, applied very carefully by means of a camel-hair pencil to the inner surface of the upper lid, also previously everted and dried. The two remedies may occasionally be advantageously alternated. Pencilling the granular surface with Goulard's extract is now and then followed by speedy amendment; but, on the whole, it is inferior to the copper and nitrate of silver. The great objection to this article, and also to the ordinary solutions of lead, is their liability to incrust the cornea, and thus produce mechanical obstruction.

When the reproductive tendency of the granulations is very great, I have found marked benefit from frequent scarification of the lid, and the occasional application of two or three leeches to the neighborhood of the outer canthus. I know that the former of these remedies has met with much opposition, but I can attest its beneficial effects from ample experience.

When the general health is enfeebled, a tonic course of treatment will be required, and this will be the case with a majority of the patients whom we are obliged to attend in our larger cities, and in the wards of the more crowded hospitals. Under such circumstances signal benefit will accrue from the use of quinine and iron, iron and extract of bark, cod-liver oil, and similar articles, with a nutritious diet, exercise in the open air, and attention to the skin. Whatever means be adopted, steady perseverance, both on the part of the patient and the surgeon, will be indispensable to a final and permanent cure. All indiscretions must be avoided, for there is no disease more liable to relapse than granular conjunctivitis.

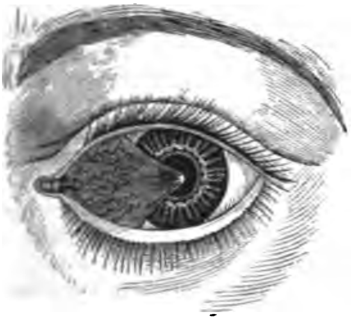
The corneal opacity, which is so common an attendant upon this disease, unless very great, usually disappears as the lids regain their normal condition. Should it be slow in going away, the cure may be expedited by the daily application to the edge of the lower lid of a little very dilute ointment of the oxide of zinc, nitrate of silver, or red oxide of mercury. The same means will also be useful in effecting the removal of the granulations.

Finally, in concluding my remarks upon the treatment of conjunctival ophthalmia, I feel it my duty to impress upon the mind of the practitioner the indispensable necessity, in every case attended with muco-purulent discharge, of isolation of the patient as far as the use of his bed, towel, and basin is concerned; for, although it would be absurd to say that every discharge of the kind is contagious, we cannot observe too much circumspection in regard to those whose occupation compels them to be constantly in contact with the subjects of these maladies. If we must err, it is certainly best to err upon the side of safety.

Pterygium.—Pterygium is a membranous growth of the conjunctiva, or, more properly speaking, a hypertrophous state of the conjunctiva, generally remarkably vascular, several shades darker than the surrounding surface, and of a triangular shape, the apex corresponding to the cornea, and the base to the outer canthus, as shown in fig. 127. It is commonly situated upon the nasal aspect of the eye, but it may occur upon the temporal side, or even in the perpendicular diameter of the organ. Only one such growth is ordinarily met with; in some cases two are observed, as in fig. 128, and instances have been recorded where there were as many as three, and even four, although such a phenomenon is extremely rare. Sometimes, also, the pterygium, instead of being horizontal or perpendicular, is more or less oblique, and deviates remarkably from the triangular form.

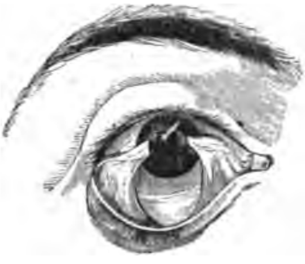
The starting-point of a pterygium is generally a short distance from the cornea, presenting itself in the form of a little elevation, of a vascular and somewhat yellowish appearance, which, gradually assuming a membranous form, extends, on the one hand, outwards towards the canthus of the eye, and, on the other, inwards towards the cornea, upon which it always encroaches to a greater or less extent, rarely, however, in any case, passing beyond the middle line. When it is developed upon the nasal side of the eye, it generally, in its progress, involves the semilunar valve, and hence it has sometimes been supposed, though erroneously, to originate in that structure. The causes which give rise to pterygium are generally such as produce chronic inflammation, but in many of the cases that have fallen under my observation it came on spontaneously, without any antecedent or accompanying disease of this kind.

Fig. 127.



Pterygium.

Fig. 128.



Double pterygium.

Pterygiums vary much in their structure; some are quite thin, as if they consisted merely of an additional layer of conjunctiva; others, on the contrary, are very thick, and of a tough, fibrous consistence. Numerous vessels, generally arranged in a straggling manner, and occasionally little granules of fat, frequently exist in them; but in cases of long standing they are often very white, and non vascular. That they consist mainly in a hypertrophous condition of the conjunctiva, is shown by the fact that the morbid growth is inseparably incorporated with that membrane, that it always lies loosely upon the sclerotica, and that it follows the conjunctiva in its reflection over the cornea, where its attachment is always extremely close and firm.

The principal inconvenience of a pterygium is of a mechanical character, interfering somewhat with the movements of the eye. It is seldom productive of pain, but the subjects of it are more prone to inflammation than common persons. Vision is not materially impaired, except when the membrane encroaches considerably upon the cornea. The affection is much more common in elderly subjects than in young, and in men than in women.

Nothing is to be expected from local applications in pterygium, even in its earlier stages; I would, therefore, strongly advise against any measures of this kind, nor would I recommend interference so long as the eye is comparatively comfortable, and vision is not materially impaired; the disease is attended with no danger to the eye, and, unless the patient is very particular about his appearance, he may as well put up with his inconvenience, for it really seldom amounts to anything more.

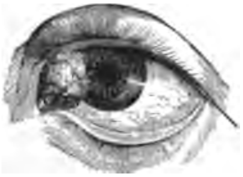
Should an operation be demanded, it is easily executed by seizing the pterygium at its middle with a pair of forceps, and, drawing it away from the globe, shaving it off with a narrow scalpel. Special care is taken to dissect away its corneal attachments, which, as already stated, are always very firm. Some surgeons prefer making the excision with the scissors, but I am satisfied that the operation can be performed much more effectually, though perhaps not so rapidly, with the knife. As soon as the morbid growth has been removed, a piece of sulphate of copper should be gently applied to the wound, especially to its corneal portion, in order to prevent a recurrence of the disease, to which there is generally, particularly in elderly subjects, a remarkable proclivity. The application is afterwards repeated every fourth or fifth day, until it is found that all repullulating tendency has ceased. A few leeches, applied near the canthus of the eye, will sometimes greatly accelerate the cure.

Xeroma.—The word xeroma is employed to denote a remarkable dryness of the conjunctiva, chronic in its character, and associated with more or less thickening and induration of the membrane, which looks more like skin than mucous tissue. The best idea that I can give of the diseased structure is that it resembles the eyelid of the land frog, and similar reptiles. The morbid change is usually universal, affecting the entire conjunctiva, although it is commonly most distinctly marked in the ocular portion. In two of the three cases that have fallen under my observation, it was also very conspicuous in the epithelial lining of the cornea, which was singularly dry, slightly opaque, and studded with little grayish points, not larger than a clover seed. Of the origin and nature of xeroma we have no definite information. It has generally been ascribed to the effects of inflammation, but if this disease is capable of producing it, why does it not more frequently follow in its wake? Xeroma is extremely rare, while conjunctivitis is one of the most common of maladies. Again, it has been supposed to be caused by deficient lachrymal secretion; but such a state has been assumed rather than established by direct observation, and in a number of the reported cases of the disease it has been most satisfactorily demonstrated that the functions of the lachrymal gland were not materially, if at all, impaired. Nor can the affection be justly ascribed to a want of the proper secretion of the conjunctiva, seeing that the suppression of this secretion is a consequence, and not a cause of the morbid change. Xeroma is usually confined to one eye, the sight of which is necessarily more or less diminished, if not wholly destroyed. The three cases, which I have had occasion to observe, all occurred in old subjects; they had been in progress for many years, were attended with nearly total blindness, and came on without any assignable cause. A stiff, dry feeling of the eye, with some impediment of motion, was the chief inconvenience under which the patients labored.

Xeroma is an incurable affection. Temporary improvement sometimes follows the use of mildly stimulating unguents; but, beyond this, nothing is to be hoped for from local applications. In cases of recent standing, it might be justifiable to try the effects of excision of the diseased membrane, removing it in large sections at three or four sittings, at intervals of so many weeks. Such a procedure might, unless the regenerative tendency is very great, be perfectly successful.

Encanthis.—The lachrymal caruncle and the fold of the conjunctiva, called the semilunar valve, are liable to hypertrophy, known under the name of encanthis, represented in fig. 129. The enlargement, which occasionally attains a considerable bulk, extends along the inner margin of the lids, impedes the movements of the eye, and keeps up more or less irritation, with discharge. The tumor is often connected with obstruction of the lachrymal passages, and generally has an angry, reddish appearance. The proper remedies are leeching, scarification, and the application of nitrate of silver, with attention to the general health, which is frequently involved in the causation of the disease.

Fig. 129.



Encanthis.

A malignant tumor, of a mixed scirrhous and encephaloid character, sometimes springs from these structures; it is of a livid or purple hue, rough, knotty, or tuberculated on the surface, hard to the touch, and rapid in its growth, often attaining a considerable bulk in a few months. Its tendency is to progress, ulcerate, fungate, and finally to destroy life. Early and thorough excision affords the only chance of relief, which, however, is always very remote and unsatisfactory.

Diseases of the Submucous Cellular Tissue.—The only affections of the subconjunctival cellular tissue requiring notice, are, hemorrhagic effusions, œdema, fatty deposits, and the little parasite, called the cellular cysticerce.

Blood may be effused into the sub-conjunctival cellular tissue by accident, as a blow, or spontaneously, without any apparent cause, mental or physical. Of the latter variety I have seen a number of instances, chiefly in young persons, who were otherwise in the most perfect health. The occurrence is unattended with pain, and the extravasated blood is either limited to one or two small points, or extensively diffused over the anterior part of the eyeball. The resulting redness is altogether different from that of inflammation, and cannot be mistaken by any one at all familiar with ophthalmic affections. Very little is necessary in the way of treatment; indeed, the fluid usually rapidly disappears of its own accord. When the patient is very solicitous about himself, the discussion may be promoted by the use of astringent lotions, or a poultice composed of equal parts of the scraped root of the black bryony and the crumbs of bread, renewed from four to six times in the twenty-four hours.

Œdema of the areolar tissue beneath the conjunctiva is of two kinds, the passive and active. The first is the result of a slow effusion of serum, in consequence usually of a retarded state of the venous circulation, of which the exciting cause is compression by some tumor, abscess, or other obstruction; the conjunctiva is elevated in the form of a small bladder, of a white, almost shining appearance, soft and inelastic, and perfectly free from pain. The active variety, usually known under the name of chemosis, is a much more serious disease; it has already been described in connection with purulent ophthalmia, with which it so often coexists, and of which it forms one of the most dangerous complications, from its tendency to induce gangrene of the cornea. It is always produced under the influence of inflammation, and is commonly of a sero-fibrinous character, instead of being purely serous as in the passive form. When it exists in its highest grade, the swelling forms a ring around the cornea, often a few lines deep, by which this membrane is sometimes nearly buried. The proper remedy, as before remarked, is free scarification, to afford vent to the effused fluids, followed by the application of a weak solution of nitrate of silver. Nothing short of this will be likely to save the cornea.

A little *fatty tumor* occasionally forms beneath the conjunctiva, from the size of a currant to that of a pea, irregularly rounded, movable, and of a pale yellowish color. It generally receives a few straggling vessels, grows slowly, and is surrounded by a thin layer of condensed cellular tissue. The proper remedy is excision.

A species of hydatid, the *cellular cysticerce*, has been met with in this situation; the containing vesicle is about the size of a pea, and looks like a little bladder filled with water. Under the microscope, the parasite is seen to have its mouth encircled by distinct hooklets. It is sometimes developed at a very early age. The only remedy is extirpation.

DISEASES AND INJURIES OF THE CORNEA.

The most common affections of the cornea are inflammation, abscess, gangrene, ulceration, opacity, change of form, technically termed staphyloma, and fatty degeneration. Foreign bodies are also liable to enter it.

1. *Wounds.*—Wounds of the cornea may be the result of accident or design, and are either incised, punctured, lacerated, or gunshot, according to the kind of weapon with which they are inflicted. Incised wounds are generally caused by penknives and similar instruments; punctured wounds, by needles, pins, thorns, and splinters of wood; lacerated wounds, by percussion caps, pieces of glass, particles of iron, and fragments of stone; and gunshot wounds by small shot discharged in hunting birds. Sometimes the cornea is ruptured by a severe blow or fall upon the eye. However induced, the injury is always attended with an escape of at least the aqueous humor, if not also of the lens and the vitreous humor, thus greatly complicating the case, and often permanently injuring vision. Another accident, also frequently of a very serious nature, is prolapse of the iris, varying in extent, according to the size of the wound, from the smallest pin-head to nearly the whole membrane. Finally, the vulnerating body may penetrate the eye, and be retained in its humors or tunics. Unless the lesion is consider-

able, there is seldom much hemorrhage; nor is the pain generally so great as might be supposed from the delicate structure of the cornea.

Wounds of the cornea, even when of considerable size, may easily be overlooked, especially when there is no separation of their edges, because of the liability of the membrane to preserve its normal appearance. In general, however, there is no difficulty in arriving at a knowledge of the nature of the case by standing behind the patient and looking at the cornea, as the eye, turned towards the light, is moved about in different directions, the lids being at the time held carefully out of the way. In addition to this, the iris often presents a peculiarly collapsed appearance, contrasting strikingly with that which it exhibits in the normal state.

Little superficial abrasions, resembling the merest possible scratches of the skin, are now and then found upon the cornea, as the result of external violence; they involve simply the epithelial covering of the membrane, and are distinguished by the exquisite pain which attends them, which is often much greater than when the wound is deep and extensive.

The first indication in wounds of the cornea is to clear away foreign matter, and to replace the prolapsed iris or other internal structures; the second, to control the movements of the organ, and to moderate the resulting inflammation.

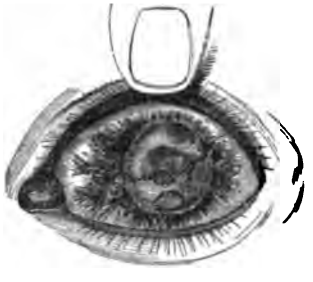
If the vulnerating body is imbedded in the substance of the cornea, it should be carefully withdrawn with the forceps; if it has passed beyond, into the interior of the eye, and is accessible, it may, perhaps, be extracted in a similar manner; at any rate, an attempt should be made to seize and dislodge it, lest, if permitted to remain, it should not only produce destructive inflammation, but become a source of the most horrible suffering, for which it may be necessary, at a subsequent period, to evacuate the humors of the organ.

Replacement of the iris is best effected with a delicate probe, the patient, especially if a child, being under the influence of chloroform. Unless this is the case, it will often be extremely difficult to succeed in our efforts. The surgeon, availing himself of the temporary calm, restores the prolapsed membrane, and carefully adjusts the edges of the wound, which generally unites by the first intention, leaving little, if any, defect in vision. If the lens becomes opaque, in consequence of involvement in the lesion, the case is afterwards treated as one of ordinary cataract.

The second indication is fulfilled by strapping the lids of both eyes, excluding the light from the room, and employing the antiphlogistic regimen. A full anodyne is administered immediately after the accident. The patient must be closely watched, and we should not hesitate, if he is plethoric, to remove blood freely by the lancet and by leeches. Care must be taken, however, not to carry the depletion too far, lest it should interfere with the reparative process.

2. *Inflammation.*—Corneitis, delineated in fig. 130, is characterized by a hazy state of the affected surface, and a zone-like appearance of the vessels at the periphery of the cornea, which is often quite vascular for the distance of nearly a line beyond this point. The vessels are greatly engorged, yet so extremely delicate as to render it difficult to distinguish them well without the aid of a magnifying glass. The conjunctiva, iris, and sclerotica usually participate in the morbid action, and hence the case is apt to exhibit the characters common to inflammation of all these structures. The opacity of the cornea begins at an early period of the disease, and sometimes extends over the whole surface of the membrane, although, in general, it is more distinctly marked at some points than at others. Its immediate cause, of course, is an interstitial deposit of plasma.

Fig. 130.



Corneitis.

The pain of corneitis is severe, and is seldom limited to the inflamed membrane, but extends to the other structures of the eye, the orbit, temple, cheek, and forehead. Hemicrania is often a marked symptom. The eye is exceedingly intolerant of light, and there is abundant lachrymation, although but little secretion of mucus, or deposit of muco-purulent matter. When the inflammation is unusually violent, there may be constitutional involvement, as indicated by fever and other disorders; but, in most cases, there is an absence of general derangement. The characteristic phenomena are the opacity of the membrane, and the zonular arrangement of the vessels at its circumference. In iritis, the vascular zone does not extend quite so far forward; hence there is always a narrow ring of comparatively healthy sclerotica between it and the cornea.

The *causes* of corneitis are various, and often difficult of recognition; in most of the cases, however, that fall under the observation of the American practitioner, the disease is induced by external injury, or by a scrofulous taint of the system. The eruptive fevers, as measles, scarlatina, and smallpox, are frequently followed by a bad form of corneitis. In rheumatic and syphilitic sclerotitis, the cornea is very apt to participate in the morbid action.

Corneitis may terminate in resolution, the haziness and vascularity of the affected tissues gradually disappearing; or it may pass into the chronic state; or, finally, it may lead to suppuration, ulceration, or gangrene.

In the *treatment* of corneitis, care must be taken not to carry the antiphlogistic measures too far, as we should be likely to do, if we were to adopt, without reserve, the injunctions of some ophthalmic writers. Unless the action is extremely violent, we shall rarely have occasion for the use of the lancet, or even the application of leeches, the disease generally yielding, in due time, to gentle, but steady, purgation, abstinence, the antimonial and saline mixture, and the exclusion of light. The eye is kept in a state of quietude by anodynes, given in full doses once or twice in the twenty-four hours.

When the disease is of a strumous nature, the best remedy, according to my experience, is quinine, along with a minute quantity of antimony and opium, steadily persevered in for many weeks. When there is an anemic condition of the system, the quinine and other articles here mentioned may be advantageously combined with some preparation of iron, as the iodide, sulphate, or precipitated carbonate.

Should the inflammation be plainly of a rheumatic origin, colchicum will be indicated, and should be used in the manner detailed under the head of sclerotitis. The syphilitic form of the disease is to be treated with mercury and opium, either alone, or in combination with iodide of potassium.

Inflammation of the cornea dependent upon measles, scarlet fever, and smallpox, must be treated with mild means, as poppy fomentations, tonics, especially quinine, anodynes, and a supporting diet. Active treatment is out of the question.

When corneitis, however induced, becomes chronic and rebellious, benefit will accrue from change of air, tepid bathing with salt water, tonics, and gentle, but steady, counter-irritation.

3. *Syphilitic Corneitis.*—In syphilitic iritis the cornea frequently participates in the morbid action, but there is a form of inflammation, the result of a syphilitic taint of the system, in which, as was first satisfactorily explained by Mr. Hutchinson, of London, the disease is, in great degree, limited to this membrane. The subjects of the inflammation are children and young persons from five to eighteen years of age, with coarse flabby skin, pits and scars on the face and forehead, cicatrices of old fissures at the angles of the mouth, and a peculiar depression of the bridge of the nose. The permanent teeth are of a bad color, remarkably small and stumpy, and vertically notched at their edges. These changes are most conspicuous in the upper incisors, but are also observable in some of the other teeth, especially the canine. The history of the attack usually shows that the eldest child is the sufferer, and that well-marked symptoms of inherited syphilis existed during infancy, such as sore mouth, cutaneous eruptions, chronic snuffles, and ulcers about the anus.

The earliest evidence of this affection is a diffused haziness in the centre of the cornea, like that of ground glass. White specks soon appear, not upon the surface, but deep in the substance of the cornea, and, gradually coalescing, thus greatly increase the opacity. The conjunctiva and sclerotica show originally little, if any, augmented vascularity, but, in time, they become discolored and engorged, and a delicate plexus of vessels extends over the cornea, into the inflamed tissues, particularly along the upper and central portion of the membrane. The vessels are small, closely set, and deeply situated, not superficially, as in granular disease and other forms of ophthalmia. No tendency to ulceration manifests itself. The affection usually begins in one eye, but ultimately—generally in six or eight weeks—the other is liable to suffer in a similar manner.

The treatment essentially consists in the exhibition of iodide of potassium or iodide of ammonium along with bichloride of mercury, quinine, bark and iron, an occasional laxative, a generous diet, and gentle exercise in the open air. Ptyalism must be carefully avoided. The opacity is generally very obstinate, and a long course of medication is required for its removal. A slight degree of haziness usually remains despite our best directed efforts.

4. *Abscess.*—Abscess of the cornea is an occasional consequence of acute inflammation, especially of the traumatic and variolous forms; it is also met with, but much less frequently, in the strumous variety of the disease. The matter may be situated immediately beneath the epithelial covering of the cornea, but more commonly it is found in its substance, nearly equidistant from its two surfaces, not in a distinct, circumscribed cavity, as the term abscess would imply, but as an infiltration among the softened and disorganized fibres of the membrane. The matter, which is of a yellowish hue, is not true pus, but a mixture of pus and lymph, and hence it is always remarkably tough and viscid. The suppurative process is generally limited to a particular portion of the cornea, usually the central or inferior, but we now and then meet with cases where it is spread over its whole surface.

The formation of matter is denoted by a yellowish appearance of the cornea, and by a marked aggravation of all the local symptoms. As the fluid accumulates, the cornea becomes more prominent, and finally yields at the most diseased part, followed by an imperfect escape of its contents. It is not always, however, or perhaps even generally, that the abscess points externally; on the contrary, it frequently bursts its posterior wall, and discharges itself into the aqueous humor.

Suppuration of the cornea, unless extremely slight, is one of those untoward circumstances, the effects of which are never entirely recovered from; indeed, when the quantity of matter is considerable, the resulting opacity generally eventuates in total blindness. Hence, the practitioner should spare no pains to prevent its occurrence. The moment he finds that it is likely to take place, he should redouble his efforts to bring about resolution; he must be cautious, however, that he does not carry his antiphlogistic measures too far, otherwise he will be sure to accelerate the crisis instead of successfully counteracting it. If the patient is plethoric, additional depletion may be called for and well borne; but the reverse may be the case; he may be pale and exhausted from suffering and previous treatment, and then stimulants and tonics, as quinine, or bark and iron, with nutritious food and drink, may be proper. Much judgment will, therefore, be required to enable us to steer a correct course; one calculated to save structure and function. In regard to mercury, so frequently recommended in this affection, I believe that it will generally be found to be prejudicial, and it would probably be well if its use were dispensed with altogether. Locally, none but the blandest remedies should be employed. Puncture of the abscess may be had recourse to in the event of the matter being concentrated, to afford an opportunity for gradual drainage; but under opposite circumstances it will be well to let it alone, trusting to the operations of nature.

When the abscess bursts both externally and internally, there will be a gradual collapse of the anterior chamber; the iris will fall forwards against the cornea, and vision will be irretrievably destroyed.

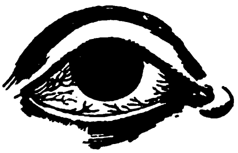
5. *Gangrene.*—Gangrene of the cornea is a frequent occurrence. It is most common in persons of a delicate, feeble constitution, after the operations for cataract, and the more severe forms of ophthalmia, especially those consequent upon smallpox and the contact of specific matter. It is often produced by excha-

rotic substances. Chemosis, a disease previously described, is very liable to produce gangrene of this structure, unless the greatest care is taken in its treatment to prevent the strangulation of the vessels of the cornea. When this event is about to take place, there is a great and rapid increase of opacity, and the membrane soon assumes a sodden, macerated, and corrugated appearance. The local symptoms suddenly increase, but as the gangrene spreads the pain usually very sensibly diminishes in intensity. A deposit of pus often precedes the occurrence of gangrene.

When gangrene is threatened, all depletory measures must, as a general rule, be at once abandoned, and the patient put upon tonics and stimulants, with a good nutritious diet, aided, if he is at all enfeebled, by milk punch and other suitable means. The cornea is touched every six or eight hours with a weak solution of nitrate of silver, consisting of about two grains to the ounce of water, and the system is kept under the full influence of opiates, both to insure quietude to the eye and to promote sleep. If mercury was previously used, it is immediately discontinued, as it cannot fail, if persisted in, to do serious harm, by still further depressing the part and system.

6. *Ulceration.*—Ulceration of the cornea, exhibited in fig. 131, is a very common event of inflammation, both of the traumatic and specific kind. We frequently see it as a consequence of the lodgment of a foreign body, and also as a sequel of strumous, variolous, morbillous and other forms of ophthalmia. The peculiarity of its structure, indeed, renders this membrane quite prone to this species of morbid action; it bears a very close resemblance to articular cartilage, and the slightest causes are sometimes found to lead to its erosion. Disease of the fifth pair of nerves is a source of ulceration of the cornea. It is probable that the protracted use of unwholesome food, especially of articles deficient in azotized matter, may induce the affection by producing an impoverished state of the blood; a condition of the system ill calculated to resist the effects of inflammation. Once set up, it is often difficult to arrest its progress, and to prevent the formation of disfiguring and injurious cicatrices. The disease may occur at any period of life, and under almost every variety of circumstance as to constitution and health, but is most common in young subjects of a feeble, delicate organization.

Fig. 131.



Ulceration of the cornea.

Ulcers of the cornea present themselves in every possible form and size, so much so, indeed, as to render it very difficult to furnish an accurate description of them. The most common variety, perhaps, is the dimple-shaped erosion, in which the part has an excavated appearance, as if a solid portion of the cornea, comprising several of its layers, had been scooped out. In another series of cases the ulcer looks like a superficial abrasion, involving merely the epithelial investment of the cornea. In the third place, the ulcer may be almost perfectly circular, and not larger, perhaps, than the diameter of a pin; this form of erosion is by no means infrequent, and is the more interesting because of its proneness to lead to perforation. Whatever form a corneal ulcer may assume, its edges are generally somewhat everted, and more or less irregular, if not ragged, as may easily be seen by a careful inspection with the aid of a glass. It is seldom that we find them inverted or undermined; cases occur in which they are very steep and abrupt, as if a piece had been cut out of the cornea with a punch. In general they have a slight hazy appearance, especially when cicatrization is about to begin, or has already made some progress. The bottom of the ulcer is either natural, or it is of a pale ash hue, and more or less irregular. In regard to size, ulcers of the cornea vary from that of a clover seed to that of a split pea..

Ulcers of the cornea are generally attended with considerable pain, lachrymation, and intolerance of light, along with more or less vascularity of the diseased structures. If their progress is not early checked, they may extend in depth until they cause perforation of the membrane, followed by an escape of the aqueous humor and prolapse of the iris. Another bad effect to which they are apt to lead is incurable opacity, a natural result of the reparative process, especially when the erosion is of any depth or extent.

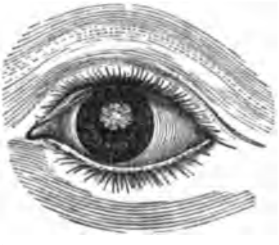
Unless great care is exercised, an ulcer, even of considerable size, may exist upon the cornea, and yet entirely escape detection. To conduct the examination in a proper manner, the surgeon should stand behind the patient, who sits with his face fronting the window. The eye being now depressed, while the lids are held out of the way, the light will fall in a full stream upon the cornea, and thus disclose any breach that may exist upon its surface.

The *treatment* of ulceration of the cornea requires great judgment and alacrity. Under an idea that the disease is generally one of over-action, the plan commonly pursued is to deplete the patient, if not by the lancet, at least by leeching and purgation, to a point beyond what is proper for the restorative process. The consequence too often is that the disease is aggravated instead of being relieved. Experience has shown me that, in nearly every instance, the affected part will be immensely benefited by an invigorating plan of treatment, consisting of the liberal use of quinine, or quinine and iron, along with a nutritious diet, and a full anodyne at least once in the twenty-four hours, especially if there is much pain. When the system is plethoric, and when there is an unusual degree of vascularity of the cornea and other structures, a few leeches occasionally to the neighborhood of the outer canthus, and the steady, but moderate, use of the antimonial and saline mixture, with a grain, or a grain and a half of quinine to every dose, will go far in putting a speedy stop to the disease.

As it respects direct applications, the fewer we make, as a general rule, the better. Under the means just pointed out, the reparative process usually proceeds very kindly, and, unless the breach is uncommonly large, little or no opacity may be expected. It is only, or, at least, principally, when there is a disposition in the ulcer to extend, as when it has a foul unhealthy aspect, that local remedies are at all called for, and then great care should be taken that they are as mild and soothing as possible. Of these, the most eligible is a solution of nitrate of silver, in the proportion of two to ten grains to the ounce of water, applied directly to the sore by means of a very small camel-hair pencil once a day, or every other day, according to the exigencies of each particular case. A very dilute ointment of the oxide of zinc, or oxide of mercury, also answers a good purpose, but is, on the whole, inferior to the caustic. When the ulcer is of an unhealthy, phagedenic, or sloughing character, its surface may be touched with a stronger solution of nitrate of silver, or this article may be applied very gently in substance, shaped to a very minute point.

7. *Opacity.*—Opacity of the cornea exists in various forms and degrees, from the smallest visible speck to a patch large enough to cover its entire surface. A hazy appearance of the membrane is present in almost all cases of corneitis, however slight. The more marked and concentrated forms of opacity are generally the result of the cicatrization of deep ulcers and badly healed wounds. When the opacity is slight, it is usually designated by the term nebula, literally signifying a cloudy condition of the part; the hard white, milky, concentrated spot, on the contrary, is known by the name of albugo, represented in fig. 132. As meaning the same thing, the word leucoma is sometimes employed. The distinction between nebula and albugo has a real practical significance; the former often disappearing spontaneously, or under very simple measures, whereas the latter seldom wholly subsides, whatever treatment may be adopted for the purpose. Nebula, as it usually presents itself, is situated either in the epithelial investment of the cornea, or immediately beneath it, in the superficial layer of this membrane, and often occupies a large extent of surface; in some cases it is situated more deeply, and instances occur, although they are rare, in which it is seated between the membrane of Demours and the posterior lamella of the cornea.

Fig. 132.



Opacity of the cornea; an example of albugo.

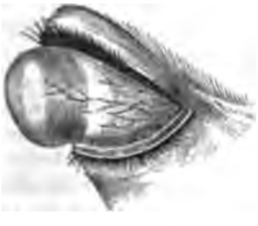
Albugo, which frequently embraces the entire thickness of the cornea, is generally very hard and dense, white, milky, or chalk-like in its appearance, and of a circular, linear, or angular shape, its surface being sometimes smooth, at other times rough. It is essentially an analogous tissue, but so imperfect a copy of the original that it can hardly be said to bear any resemblance to it. Finally, cases occur in which this substance is partially transformed into fatty matter, fibro-cartilage, cartilage, or even bone.

The slighter forms of corneal opacity often disappear with the inflammation which has produced them, or within a short time after, under the influence simply of the absorbents, now no longer kept in abeyance by the secernents. Should the case prove tedious, or not proceed satisfactorily, measures must be taken to promote the removal of the effused matter, among which the best are alterant tonics, as quinine and iodide of iron, with a very minute quantity of tartar emetic, as the one-twentieth of a grain, three times a day; iodide of potassium; or a very mild course of mercury, carried to the extent of the slightest possible ptyalism. The cure will be expedited by the use of some mild local stimulant, as a few drops, twice a day, of a very weak solution of acetate of zinc, nitrate of silver, or acetate of lead, or a very weak ointment of oxide of mercury, nitrate of silver, or oxide of zinc. I have derived great benefit, under such circumstances, from a little thin molasses poured upon the opaque cornea once a day, and also from washing the eye night and morning with tepid water, rendered gently stimulating with a little common vinegar or salt. Indeed, almost any substance, provided it does not act as an irritant, will prove useful in most cases of nebula.

For albugo in its various forms, surgery holds out no prospect of relief; it is an organized tissue, part and parcel of the cornea, and no remedies, either local or general, can remove it. The idea of curing an albugo by paring it away is simply ridiculous, and implies a very imperfect knowledge of the nature of the disease. The operation of excision, and of uniting the wound by suture, proposed by Dieffenbach, is still more preposterous; and the recent suggestion of Dr. Nussbaum, to cut out the opaque spot, and make the patient wear a small piece of glass, shaped like a shirt-stud, caps the climax of absurdity. When the opacity does not affect the entire centre of the cornea useful vision may occasionally be procured by constant dilatation of the pupil with atropia.

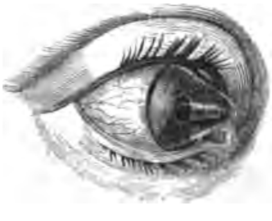
8. *Staphyloma.*—Alterations of form of the cornea are technically known under the name of staphyloma; they are an occasional effect of inflammation and external injury, and occur in every intermediate degree, from the slightest aberration of the normal shape to the most hideous deformity. Two principal varieties of the disease are usually recognized by authors, the spherical, seen in fig. 133, and the conical, fig. 134, but as they do not differ from each other in their character or mode of development, the distinction might as well be abolished, as it is only calculated to lead to erroneous notions of pathology and practice.

Fig. 133.



Spherical staphyloma.

Fig. 134.



Conical staphyloma.

The immediate *cause* of staphyloma is a weakened and attenuated condition of the cornea, especially of its central portion, in consequence of which it is incapable of resisting the pressure of the aqueous fluid as it accumulates, now in increasing quantity, in the anterior chamber. More or less opacity and a certain degree of abnormal vascularity attend the development of the disease, the progress of which is always tardy, several years usually passing by before it attains much bulk. The tumor is commonly of a conical form; and, as it proceeds, it gradually projects beyond the lids, separating them from each other, and descending towards the cheeks, its length varying from a few lines to several inches. That portion which lies beyond the level of the lids is usually very hard, more opaque than the rest, and constantly inflamed, from the fact that it is incessantly exposed to the light, and to the contact of all sorts of irritants. When the disease is fully developed, the anterior chamber is annihilated, the iris being lacerated, and closely adherent to the posterior surface of the cornea. Vision is always greatly impaired, and often completely destroyed. The staphyloma, after having attained a certain height, remains either stationary, or ulceration sets in, followed by perforation of the membrane, and the escape of the aqueous humor.

There is a form of this affection which appears to consist in a hypertrophous condition of the cornea, its development being altogether independent of inflammatory action. The affection involves both eyes, though rarely in an equal degree, and is most common in young subjects, from the age of eighteen to thirty. The tumor is smaller than in the inflammatory variety, and also retains a greater amount of transparency, the opacity being generally limited to the part projecting beyond the lids. The iris preserves its normal position, the pupil moves with its accustomed freedom, and the anterior chamber, instead of being obliterated, as in the ordinary form of the disease, is only enlarged and changed in shape. Vision is more or less impaired, and the cornea is remarkable for its glistening, sparkling appearance. The cause of the lesion is not understood.

In the incipient stage of staphyloma a gently antiphlogistic course will sometimes be of service, if not in permanently arresting the disease, at all events in staying for a time its progress, and in preventing it from attaining so great a development as it otherwise would. The best remedies will be mild astringents, particularly the different preparations of nitrate of silver, ointment of the oxide of mercury, and solutions of zinc and lead, with frequent puncture of the cornea to take off the pressure of the aqueous humor. In general, however, these means will fail, and the surgeon will, therefore, be compelled to resort to other measures, especially if the tumor has attained so much bulk as to be constantly irritated by the contact of extraneous matter. The most appropriate remedy in this case is excision of the cone, or of all that portion which projects beyond the edges of the lids. For this purpose, the lids being held carefully out of the way, the apex of the tumor is transfixed with a tenaculum, and the knife—a sharp, narrow bistoury—is rapidly carried from above downwards, cutting off the requisite amount at a single sweep. Care is taken not to remove too much, otherwise the eye may either collapse from the evacuation of its humors, or, at all events, shrink so much as to interfere with the wearing of an artificial one.

For the non-inflammatory species of conical cornea there is no cure. The probability is, as before stated, that it is merely a form of hyper-nutrition, and if this opinion is correct, it is not surprising that it should be entirely beyond the control of remedies.

9. *Fatty Degeneration.*—Fatty degeneration of the cornea is rather of pathological than of surgical interest, and may, therefore, be dismissed in a few words. This affection, formerly known under the name of the senile arch, has been shown, within the last few years, to consist essentially in a transformation of the horny tissue of the eye into a substance resembling fat; it is of a dim pearl color, loaded with oily matter, and considerably softer than the adjacent healthy structure, in which it is insensibly lost. The altered part presents itself in the form of a ring, at the periphery of the cornea, near its junction with the sclerotica. The fatty transformation is not peculiar to the old, as the term senile would suggest, although they are undoubtedly most subject to it. It has occasionally been witnessed in children, and I have myself seen two cases of it before the age of twenty. It is often associated with fatty degeneration of the heart, arteries, liver, and other organs.

DISEASES AND INJURIES OF THE SCLEROTICA.

The sclerotica is liable to wounds, staphyloma and inflammation.

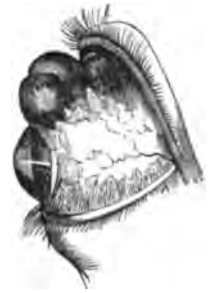
1. *Wounds.*—Wounds of the sclerotica may be of various kinds, as incised, punctured, and lacerated. They are, in general, easily recognized by their gaping appearance, caused by the retraction of their edges, which is always proportionately great. If the sclerotica alone has been divided, the bottom of the wound will be formed by the surface of the choroid, and will, consequently, present a black appearance. If this membrane is also divided, there will probably be a sac-like protrusion of the retina; and should the lesion embrace all the tunics, there will necessarily be an escape of more or less of the vitreous humor.

Incised wounds of the sclerotica readily unite by adhesive inflammation, the plasma which fills the gap becoming speedily organized and transformed into an analogous tissue. To promote this occurrence, both eyes should be subjected to the most perfect repose, for at least a week, by confining the lids with strips of isinglass plaster, as after the operation for cataract and artificial pupil. The patient remains in a dark room, purges himself well, and lives upon light food.

Laceration of this membrane may be caused by a blow of the fist, by the forcible contact of a stick, or by a fall upon the globe. What is remarkable is, that the rupture usually occurs at a point opposite to that to which the violence has been applied, by a sort of contre-coup, or excessive distension of the fibres of the tunic. Hence, its most common site is either the upper or inner part of the sclerotica, where injury is seldom or never inflicted, the nose and superciliary ridge serving to shield it. The rupture may be limited to the sclerotica, or it may involve the other tunics; in the latter case it is liable to be attended with escape of the vitreous humor, and of the crystalline lens into the sub-conjunctival cellular tissue. The treatment is the same as in an ordinary incised wound. If the lens is dislocated, it should immediately be removed by a small incision, otherwise it may, by its pressure, interfere with the repair of the breach in the sclerotica.

2. *Staphyloma.*—Staphyloma of the sclerotica signifies a tumor formed by the protrusion of this membrane beyond its natural level. The exciting cause is usually an abnormal accumulation of aqueous humor in the posterior chamber of the eye, in consequence of the occlusion of the pupil, or of the attachment of the iris to the surface of the cornea. The pressure thus occasioned produces atrophy, and, finally, excessive attenuation of the sclerotica, followed by a separation of its fibres and the protrusion of the other membranes of the eye. The fact is, the mode of formation is identical with that of the pouches which sometimes occur in the intestines and the urinary bladder, and which are so minutely described in most works on pathological anatomy. The affection is always accompanied by a discolored and disorganized condition of the inner structures of the eye. The size of the tumor varies from that of a currant to that of a hazelnut; it may be rounded or ovoidal in its shape, and has usually a bluish, purplish, or blackish appearance, from the presence of the pigmentary matter of the choroid. When the membrane is diseased at several points, there may be a corresponding number of protrusions, occurring either singly or in clusters. The annexed sketch, fig. 135, conveys an excellent idea of the situation, size, and shape of these tumors.

Fig. 135.



Staphyloma of the sclerotic coat, seen in profile.

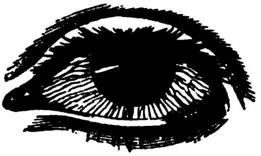
The *prognosis* of this affection is of the worst character; its very existence affords irrefragable evidence of incurable disease of the other structures of the eye; and hence it would be absurd to subject the patient to treatment, except in so far as it may be designed to relieve deformity. With this object, the removal of the tumor may be attempted by snipping off the most prominent portion, trusting to shrinking for the disappearance of the remainder.

3. *Sclerotitis.*—Inflammation of the sclerotica seldom exists as a pure, uncom-

plicated affection; most commonly it arises during the progress of other ophthalmic diseases, especially corneitis and iritis. As an independent lesion, it may be induced by various causes, of which the principal are exposure to cold, a rheumatic or gouty state of the constitution, the action of the syphilitic poison, and the effects of mercurialization. It is most common in middle-aged and elderly subjects, and winter and spring are its favorite periods of attack.

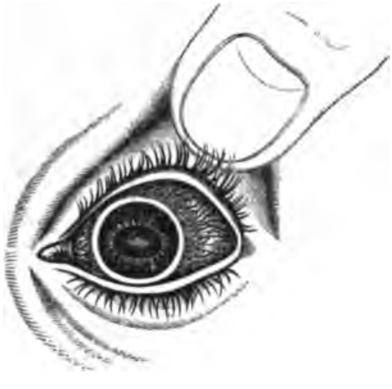
The *symptoms* of this disease are in general well marked. The pain is severe, throbbing, deep-seated, and liable to vesperal exacerbations; it usually extends to the forehead, temples, and upper part of the cheeks, and is aggravated by recumbency, and by the slightest motion of the eye, which feels full and tight, as if it were compressed by the hand. When the pain is less severe, the organ is sore and tender, or the seat of a distressing aching sensation. During the night, the suffering is often so excessive as to deprive the patient entirely of sleep, compelling him to sit up in bed, or walk the floor. In many cases there is hemicrania, or a dull, heavy, aching pain in the side of the head, with great tenderness on pressure. In some cases, again, the pain is of a neuralgic character, recurring in regular paroxysms once or twice in the twenty-four hours. The eye is intolerant of light, the smallest quantity generally proving a source of extreme suffering; and there is always an abundant secretion of tears, though usually very little discharge of mucus, or of mucus and pus. Hence the edges of the lids do either not adhere at all, or only in a comparatively slight degree. If the eye be carefully inspected, it will be found that the discoloration is deep-seated, and of a faint bluish, pink, or lilac appearance, the vessels upon which it depends being exceedingly delicate, and disposed in parallel lines, converging towards the cornea, as in fig. 136, immediately behind which they are very numerous and conspicuous, forming a well marked zone around its periphery.

Fig. 136.



Sclerotitis.

Fig. 137.



Sclerotitis extending to the internal tunics.

The disease, in its earlier stages, is in great degree, if not exclusively, limited to the sclerotica; in a short time, however, it involves the other structures, especially the conjunctiva, cornea, and iris, as is seen in fig. 137. When this is the case, the ball of the eye often exhibits a bloodshot appearance; there is more or less haziness of the cornea, with an enlargement of its vessels; the pupil is sluggish, or entirely immovable, and the surface of the iris is altered in its color. The lids are rarely, under any circumstances, materially involved in the morbid action. Much diversity obtains in regard to the state of the constitution; in many cases there is an entire absence of fever, while in others it may be present from the beginning, and constitute one of the most prominent symptoms.

The *diagnosis* of sclerotitis is sufficiently easy, particularly in the earlier stages of the disease. The history of the case, the character and intensity of the pain, the excessive lachrymation and intolerance of light, and the peculiar nature of the vascularity of the affected membrane, cannot fail to enable the practitioner to distinguish it from other ophthalmic affections. In conjunctivitis, the discoloration is superficial, and of a scarlet hue; in sclerotitis, it is deep-seated, and of a pale pink, bluish, or lilac tint; in the former, the vessels are very large and arranged arborescently; in the latter, extremely small, almost hair-like, and disposed in straight, parallel lines, extending from behind forwards towards the cornea. Finally, in conjunctivitis, the vessels are movable; in sclerotitis, on the contrary, they are fixed.

In the *treatment* of this malady, the practitioner must be influenced by the nature of the exciting cause, and the actual condition of the system. The milder, non-specific forms of the disease will generally readily yield to active purgatives, light diet, and diaphoretics, particularly Dover's powder, or antimony and morphia, with cupping or leeching of the temple. If the patient is plethoric, and the inflammation very severe, blood should be taken freely from the arm, and the system kept constantly under the influence of the saline and antimonial mixture, with calomel and an anodyne at night, to act upon the secretions, and to promote sleep.

In *rheumatic* sclerotitis, the best remedies are colchicum and morphia, given in full doses early in the evening, and in small doses several times during the day. My usual practice is to administer a drachm of the wine of colchicum, towards bedtime, along with a grain of morphia, using a hot and slightly stimulating foot-bath immediately after, so as to throw the patient, if possible, into a copious perspiration. The next morning, about ten o'clock, half the quantity of these articles is given, or the dose may be still smaller, according to the tolerance of the system.

Syphilitic sclerotitis must be treated with calomel and opium, or some other form of mercury, carried to gentle ptyalism; or, what will usually be found to answer better, the iodide of potassium, in doses of ten to twenty grains three times a day, combined with an anodyne, especially towards bedtime. A similar plan will be called for when the disease has arisen from the inordinate use of mercury; in this case, indeed, gentle ptyalism is generally an indispensable element in the treatment.

Anodyne liniments, embrocations, and unguents, applied freely to the forehead, cheek, and temple, are often of great benefit in sclerotitis, however induced; the use of medicated steam, directed upon these parts, will also be found very agreeable and soothing. In most cases, it will be necessary to take blood from the neighborhood of the inflamed organ by cups or leeches. As to counter-irritation, in all its forms, I am generally averse to it, for the reason that I have usually seen it do harm instead of good. This is especially true when it is applied to the temple, behind the ears, or even to the nape of the neck. It is less objectionable when applied to the arm, but even then it often fails to be of any material use in removing the morbid action.

When sclerotitis becomes chronic, a mild course of alterants and tonics will be necessary, aided by a properly regulated diet, tepid bathing, and change of air.

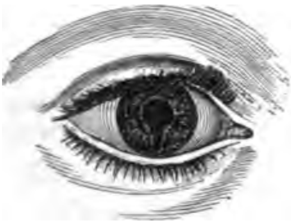
DISEASES AND INJURIES OF THE IRIS.

The iris is liable to various accidents and diseases, of which the most common and important are, wounds, inflammation, prolapse, and morbid adhesions. I am not aware that it is ever the seat of any of the heterologous formations. The inflammation which assails it may be of the common kind, although this is exceedingly rare, or it may be caused by a rheumatic, syphilitic, or strumous state of the system. Finally, the iris is often the seat of interesting and delicate operations, rendered necessary on account either of its own diseases or of diseases of the cornea obstructing vision.

1. *Congenital Vices.*—The iris is subject to congenital malformations, of which the most common are absence of the membrane and irregularity of the pupil. The former of these defects, which has been termed *irideremia*, is necessarily attended with very imperfect vision, the eye, in ordinary light, being constantly dazzled by objects, and disposed to roll about. In the only instance that I have ever seen of it, the child was nearly blind, and the interior of the globe, instead of being of a reddish tint, as usually represented by authors, was remarkably black. In some of these cases the iris is not completely absent, but exists in a rudimentary state, forming a narrow ring at the periphery of the cornea.

In a case of malformation which I saw not long ago, the pupil had the appearance of being double. It occurred in a man, aged twenty-eight, whose sight was perfect, although both eyes were in precisely the same condition. The pupil, which readily obeyed the light, was situated nearer the inner than the outer side of the globe, and occupied the inferior portion of the iris, extending down to the margin of the cornea. The more common variety is represented in the annexed sketch, fig. 138. The defect is called *coloboma of the iris*. The fissure is of a triangular shape, the apex extending downwards towards the ciliary margin of the iris. In rare cases, the pupil, although well formed, has been found to be situated out of its usual place.

Fig. 138.



Congenital fissure.

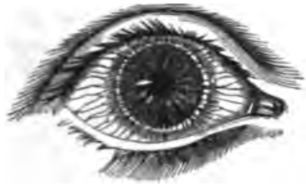
2. *Wounds.*—Wounds of the iris are inflicted either designedly, as in the attempt to form an artificial pupil, or accidentally, as in the operation for cataract, and under other circumstances. The chief interest which such lesions possess is that they are seldom productive of serious inflammation, although the plastic matter that is poured out is very apt to cause morbid adhesions, interfering more or less with vision. Sometimes the iris is torn off from its ciliary attachments by a blow or fall, leading thus to the formation of a species of artificial pupil; the opening, even if comparatively small, never closes; while, if it is at all large, it will seriously encroach upon the natural one, diminishing its size, changing its form, and crippling its action. Whatever the character of the injury may be, the treatment must be strictly antiphlogistic, as it is of the greatest importance that the resulting inflammation should be subdued as promptly as possible. If there is any plastic deposit, mercury, carried to slight ptyalism, will be required.

3. *Inflammation.*—Iritis is a much more frequent affection than is generally supposed. From what I have seen of diseases of the eye, in private and hospital practice, I am persuaded that it is very often entirely overlooked, the malady under which the patient labors being mistaken for inflammation of the conjunctiva and sclerotica. That this should be so is not surprising when we reflect upon the fact that iritis altogether escaped the attention of practitioners until the commencement of the present century. Now, however, that its characters are so well understood, there is really no excuse for errors of diagnosis. With a little attention on the part of the medical attendant, it is as easily recognized as a boil upon the nose, a stye on the eyelid, or a wart on the finger.

Iritis may proceed from a considerable variety of *causes*, of which the most important are, external injury, exposure to intense light, suppression of the cutaneous perspiration, a strumous, gouty, or rheumatic state of the constitution, and the operation of the syphilitic virus. It often begins as a primary affection; but in many cases it is altogether of secondary origin, being the result of an extension of disease from the surrounding tissues. Finally, it may be acute or chronic, and occur in both sexes, in every class of individuals, and at all periods of life, even in very young children. When it attacks the latter as an independent affection, the probability is that it is owing to a syphilitic taint of the system, although this is by no means necessarily the case.

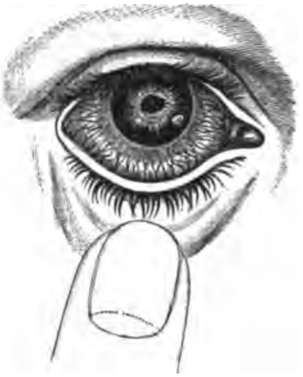
The disease frequently begins in a very insidious manner, and hence great and irreparable mischief is sometimes done before the practitioner is made aware of the nature of the case. Such an occurrence is the more likely to happen because there is often an entire absence of the more ordinary phenomena of ophthalmia, especially discoloration of the superficial tunics, and also everything like severe local suffering, calculated to arouse attention. In general, however, pain is an early and prominent symptom, or, if it is not, it is sure soon to become so; lachrymation and intolerance of light are also well marked. Unless the inflammation involves the conjunctiva, the disease may go on through its different stages, nay, even ultimately destroy the sight completely, and yet not occasion any considerable redness. In general, the discoloration is limited, at least in great degree, to the sclerotica, at the anterior extremity of which there is always a distinct zone, as in fig. 139, formed by the vessels of the fibrous coat as they dip down into the eye, to anastomose with those of the iris and choroid. This zone, which is never absent, is at first of a faint rose color, but afterwards, when the inflammation is fully established, of a deep red, cinnamon, or brick hue. At the beginning of the disease, there is a narrow ring of white between it and the cornea, but, as the morbid action advances, this is gradually lost by an extension of the vascularity. The vessels which produce the zone have a fine hair-like appearance, with a radiated arrangement, and are seated beneath the conjunctiva, in the substance of the sclerotica, in which they are immovably fixed, as seen in fig. 140. When the disease has made considerable progress, the peculiarity of this vascularity is lost, by reason of the excessive discoloration of the conjunctiva; and it should not be forgotten, as was previously intimated, that, in complicated cases or in secondary forms of iritis, it may be completely masked, even at the beginning of the attack.

Fig. 139.



Acute iritis.

Fig. 140.



Iritis; showing the characteristic vascularity of the globe, the iris being clogged with lymph, and the pupil contracted and irregular.

The *pain* of iritis varies; in general it is very severe and distressing, but I have seen cases, even of a very bad character, as it respected the state of the sight, where it was absolutely absent from first to last. Such cases are, of course, exceptional. Usually the pain is deep-seated, beginning apparently in the orbit, and rapidly involving the globe; becoming more and more severe and constant as the disease progresses; subject to violent nocturnal exacerbations; and generally, especially in the more confirmed stages of iritis, extending to the surrounding parts, particularly the temple, eyebrow, and cheek. Sometimes there is the most violent hemicrania.

The iris itself experiences most important alterations. Even at an early stage of the disease it is already quite sluggish, while somewhat later it is entirely insensible to every kind of stimulant, however strong or long continued. Its anterior surface loses its smooth, shining, fibrous appearance, and becomes rough, puckered, and dull; the pupil diminishes in size, and is ultimately almost obliterated, being, perhaps, hardly as large as a pin-hole; at the same time it is observed to be deformed, and adherent to the capsule of the lens. In addition to these characteristics, there is an extraordinary change in the color of the iris, contrasting strikingly with that of the healthy membrane, and evidently dependent upon the injected condition of the proper tissues of the part, with a slight effusion of blood, or blood and lymph. The morbid hue, usually somewhat reddish, or of a dusky brick, is most conspicuous when the iris is bluish; less so, when it is brownish or hazel. Finally, the iris is often preternaturally convex, especially towards the circumference; the pupillary margin is greatly thickened; the aqueous humor is augmented in quantity, and rendered more or less turbid; masses of lymph are frequently observed in the anterior chamber, either loose, or adherent to the diseased membrane.

When the malady is fully developed, the sight is either much impaired, or completely destroyed; for not only is the pupil greatly contracted, so as to interfere materially with the transmission of light, but there is often opacity of the cornea, cataract of the lens and its capsule, and a disorganized state of the retina and choroid, as is evinced by the frequent attacks of coruscations and other symptoms of deep-seated disease. Fever, often of a high grade, attends the earlier stages of iritis.

The *diagnosis* between ordinary iritis and iritis dependent upon rheumatism and syphilis, is often extremely obscure, and, therefore, difficult of determination. This, however, is the less to be regretted, as the treatment is essentially the same, whatever may be the exciting cause. The distinction between the rheumatic and syphilitic forms will be best understood by the subjoined tabular arrangement:—

RHEUMATIC IRITIS.	SYPHILITIC IRITIS.
1. Usually coexists with rheumatism or gout.	1. With papular eruptions, sore throat, and other evidences of syphilis.
2. Most common in elderly subjects.	2. May occur at any age, even in infancy.
3. Often only one eye suffers.	3. Generally both eyes are affected; first one, and soon after the other.
4. The zone around the cornea is of a dull, rusty red, with a white ring in front.	4. Is of a cinnamon or brownish hue, and soon extends quite up to the cornea
5. There is little or no lymph in the anterior chamber and upon the anterior surface of the iris.	5. The plastic deposits are always prominent, often presenting themselves in the form of little, fleecy, vascular, reddish-looking tubercles, attached to the surface of the iris.
6. The aqueous humor is usually clear, or nearly so.	6. Generally turbid, often highly so, and very albuminous.
7. The pain is nearly constant, though liable to exacerbations, especially at night.	7. Very bad at night, but almost, if not entirely, absent during the day.

The *prognosis* of iritis may be gathered from what precedes. Whenever the disease is severe or of long standing, little hope need be entertained of ultimate recovery. The patient, it is true, may be able to discern light, and perhaps grope his way, but, as it respects useful vision, he will not be likely to get any; for it may confidently be asserted that there is no form of inflammation which, if allowed to progress, is more certain to damage the deep structures of the eye than iritis, especially the rheumatic and syphilitic varieties.

The *treatment* of iritis must, in general, be rigidly antiphlogistic. Blood is taken freely from the arm, if the patient is plethoric, and, in almost any event, by cupping and leeching from the temples. The bowels are thoroughly evacuated with calomel and jalap, or senna and salts, the heart's action is controlled by the antimonial and saline mixture, and pain is allayed by the liberal use of anodynes. In the rheumatic form of the disease, colchicum proves a valuable adjuvant. But the great remedy in iritis, in all cases, excepting, perhaps, the most simple, is mercury, carried to the extent of rapid ptyalism. For this purpose the medicine should be given in full doses, its effects, however, being carefully watched, lest profuse salivation should arise. The best article is calomel, in doses of two to three grains every four or six hours, properly guarded with opium, and continued until the gums become tender, when it must either be withheld or administered in smaller quantities. When the calomel is tardy in its action, it may be assisted by mercurial inunctions; for, as already hinted, the object is to make as speedy an impression as possible upon the disease, in the hope of preventing its direful effects upon the pupil and lens, the integrity of which is so important to the preservation of the sight, and which is always so much endangered by neglect and ill-management. It is true that ptyalism is not at all essential to the success of the treatment, for it has been shown that the inflammation often vanishes where, although the article is freely employed, no such action follows its administration; nevertheless, the occurrence is anxiously looked for because it serves to assure us that the medicine is doing its duty.

It is not necessary here to inquire into the mode of action of mercury in iritis. The disease derives its chief importance, as far as the danger is concerned, from the fact that it is attended with an effusion of plastic matter, not only into the proper substance of the membrane, but upon its surfaces and also into the chambers of the eye, embarrassing the movements of the iris, plugging up the pupil, and causing adhesions between the affected structure and the capsule of the lens.

Now, the object in administering mercury is to prevent the deposit of this substance, as well as to promote the absorption of that which has already taken place; and that it is well calculated to do this, experience has abundantly established, although we cannot explain the precise mode of its operation. Mercury, then, is the great remedy in this disease, the remedy *par excellence,* and should be given early and freely, until it has effected the object for which it is exhibited. Its action is less apparent in the traumatic forms of iritis than in the rheumatic and syphilitic, in which it is absolutely indispensable.

The effects of the remedies here mentioned may be aided by counter-irritation, as blisters, croton oil, or tartar emetic ointment behind the ears or to the nape of the neck; but all direct applications should be dispensed with, except such as are of the most soothing character, as the steam of hot water and opium, fomentations, and light, medicated poultices. The circumorbital pains are often abated by anodyne embrocations, lotions, and unguents.

Much stress has been laid by authors upon the propriety of keeping the pupil well dilated with atropia during the progress of this disease. While every one must perceive the force of the injunction, the misfortune is that atropia does not possess this property, nor is there, so far as is at present known, any article that does. The moment the iris is actively inflamed, it ceases to be influenced by narcotic applications; the pupil contracts, and no stimulus, however powerful, can afterwards excite it.

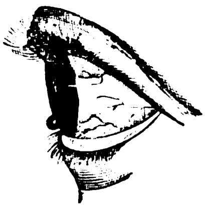
I have no experience with the use of turpentine in the treatment of this disease; I have, however, given it in several instances, apparently quite favorable for the appropriate action of the remedy, and have not been able to satisfy myself that it has been of any benefit. In the syphilitic variety of the complaint, iodide of potassium may advantageously be exhibited, to aid in completing the cure, after we have made fair trial of mercury. In debilitated persons, in chronic cases, and in the latter stages of the acute attack, tonics may be demanded, as quinine and pyrophosphate of iron, in union with extract of nux vomica.

4. *Prolapse.*—Prolapse of the iris may be caused by wound, ulceration, or sloughing of the cornea, and may present itself in two varieties of form, the partial and the complete, of which the former is by far the more common. Indeed, complete protrusion of the membrane can only occur when there is most extensive injury of the anterior portion of the ball. Partial prolapse is usually produced by ulceration of the cornea, attended with perforation of all its lamellæ. The opening thus made is immediately followed by an escape of the aqueous humor, with protrusion of the iris, by which the gap is effectually closed, and further mischief prevented. Plastic matter being effused, the prolapsed portion contracts adhesions to the edges of the ulcer, the site of which is afterwards indicated by a black spot with a slight peripheral opacity. From the manner in which the iris is dragged out of its normal position, the pupil, except in the milder varieties of the accident, undergoes important changes in its form, size, and situation, attended with corresponding alterations of sight. When the displacement is considerable, vision may be completely destroyed.

The *treatment* of this affection must be regulated by circumstances, as it is impossible to lay down any particular plan for the guidance of the surgeon. In complete prolapse, depending upon extensive destruction of the cornea, the case is, of course, hopeless; if, on the other hand, it is caused by wound, the membrane should immediately be restored by means of a probe, and the lids kept well closed with adhesive strips, until the parts have become thoroughly united. The success of the treatment will be greatly influenced by the care with which the replacement is effected; if the patient is a child, quietude should always be insured by the administration of chloroform, as it will hardly be possible to execute the procedure in a satisfactory manner without this precaution. The after-treatment is, of course, conducted upon strictly antiphlogistic principles.

When the prolapse is the effect of ulcerative perforation of the cornea, our hands are equally tied, as in the complete form of the affection. To push back the iris, under such circumstances, would only lead to worse results; instead of this, therefore, the part is allowed to keep its place, for it is nature's plug, and is absolutely necessary to close the artificial opening, however much it ma vision. This variety of prolapse is well illustrated in fig. 141. The pr part projects beyond the level of the cornea. somewhat like the head of a small fly; whence t myocephalon, applied to it by oculists. When protrudes through several apertures, it may give face of the cornea a black, tuberculated aspect, a require retrenchment, in order to prevent injuri tion of the lids.

Fig. 141.



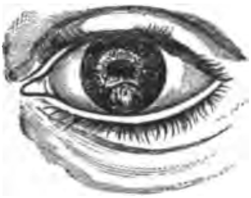
Prolapse of the iris.

In the treatment of recent prolapse, depende wound of the cornea, free use should be made c donna, or atropia, with a view of bringing the speedily as possible under the full influence remedy. By dilating the pupil, the membrane i away from the cornea, and is, therefore, less likely to be permanently inte by the edges of the wound.

5. *Synechia.*—This is the name given to an abnormal adhesion of th the cornea and capsule of the lens, the term anterior being added to d the former, and posterior to signify the latter. Anterior synechia is ca wound, ulceration, or sloughing of the cornea; posterior, by iritis, an diseases attended with plastic deposits. The lesion, in whatever form present itself, is always attended with impairment of vision, and occa with total blindness. Posterior synechia is often complicated with c When the cornea and lens preserve their transparency, and the pupil completely obliterated, sight may sometimes be improved through the a belladonna, and, at other times, by operation, the nature of which must l lated by the character of the concomitant lesion.

6. *Tumors.*—Tumors of various kinds are liable to form upon the surface of the iris, either spontaneously, or as an effect of external inj ultimately, as they increase in size, seriously encroach upon vision, which sometimes completely destroyed. Varying in bulk from a millet seed to pea, they are of a roundish shape, and of a pale brownish, drab-colored, or appearance. Their contents are generally watery. When the growth is dinate volume, it may cause ulceration and of the cornea, occasionally followed by atroph whole eye.

Fig. 142.



Encysted tumor of the iris.

A vascular tumor is sometimes developed iris, composed, as the name implies, of a cong vessels, connected by cellular substance. In of this kind, described by Wardrop, the although small, often bled so profusely, with external cause, as to fill the anterior chamb blood.

When these tumors are harmless, surgica ference is improper; if, on the contrary, the source of severe suffering, or if they encroach seriously upon the corn threaten the destruction of the eye, they should by all means be excised cystic formation is sometimes relieved by a mere puncture, just suffi evacuate its contents, and provoke obliterative inflammation.

7. *Obliteration of the Pupil.*—Obliteration of the pupil may be cau symptomatic disease of the eye, or of the general system; by loss of p the muscular fibres of the iris from interstitial deposits; or by the pres plastic matter, filling up its aperture, either as an amorphous substance, o adventitious membrane, adherent to its edges. In the latter case, the a constitutes what is termed a false cataract.

The treatment must be regulated by the exigencies of the case; by atter the general health, when that is obviously at fault; by the removal of opht trouble, as when the affection is symptomatic; by the use of atropia, operation. When the iris is not adherent, a very useful degree of visio sometimes be obtained by permanent artificial dilatation by means of atropia. Operation is indicated when the obliteration is dependent upon the presence of organized lymph, and may be executed either with a very delicate double-edged cutting needle, introduced through the cornea, as in the anterior operation for cataract, or with a cataract knife, as in the operation of extraction. Finally, when other means are unavailing, an artificial pupil may be formed, although the success of this is not by any means always, or, perhaps, even generally, certain.

ARTIFICIAL PUPIL.

The establishment of an artificial pupil, by which is meant a new opening for the transmission of light, may be rendered necessary by various causes, besides those mentioned in the foregoing paragraphs. Thus, although the natural pupil may be perfectly healthy, there may be such an amount of corneal opacity as to cause complete blindness. This, indeed, is one of the most frequent reasons for this operation; for, as already stated, the other causes of blindness occasionally admit of relief by other means.

The operation for artificial pupil demands extraordinary skill for its successful execution, and should, therefore, never be attempted by any one who does not possess the requisite accomplishments. Besides, it should not be undertaken unless there is at least a fair prospect of success. Some preliminary treatment is usually necessary, just as in the operation for cataract; and we should be fully satisfied that the internal structures of the eye have not been destroyed by pre-existing disease, otherwise, even if we succeed, vision will not be at all improved. As a general rule, it is proper not to interfere if the patient has no longer any perception of light; or if there is marked evidence of former iritis, of a dissolved condition of the vitreous humor, or of serious organic lesion of the retina, or of the retina and choroid. Finally, no operation should be performed until the eye has completely recovered from the effects of the morbid action creating a necessity for it.

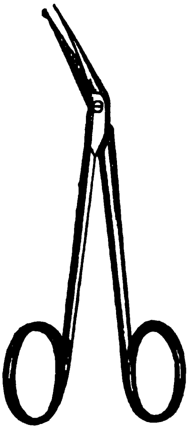
Various plans have been devised and practised for the establishment of an artificial pupil, but as far as it respects their utility, they may all be referred to three principal classes, incision, detachment, and excision. Whenever it is admissible, the new aperture should occupy the site of the old, or, at all events, be as close to it as possible, because the nearer it is to the natural axis of vision the more likely will it be to answer the object; under opposite circumstances, it should be placed towards the inferior part of the iris, or towards the inferior and external. Unless the condition of the eye renders it absolutely necessary, the opening should never be made above, as it will be constantly interfered with by the lid. Some surgeons prefer the nasal side of the iris, but this has certainly no appreciable advantages over the other situations just pointed out.

In regard to the size and shape of the pupil, no definite rules can be given. An opening, such as the iris presents in ordinary vision, in a clear, but not too bright a light, will be quite large enough, and then it will not matter particularly of what shape it is, whether circular or angular, although the former will certainly be the more seemly.

The instruments required for the operation are delicate scissors, a cornea-knife, an iris-knife, and two hooks, one sharp and the other blunt. The scissors are curved on the edge, and are provided with exceedingly slender blades, one of which is probe-pointed and longer than the other, which is sharp, and, when the instrument is shut, completely shielded by its fellow. The handles are long, and furnished each with a large ring so as to command a firm grasp. A good idea of this instrument is conveyed by the annexed sketch, fig. 143. I have never had occasion to use the canula-scissors of Mr. Wilde, of Dublin, for making an artificial pupil, as it is not easy to perceive of what use they would be in such an operation, seeing how very difficult it is to expand and move their blades. The cornea may readily be divided with any delicate cataract knife.

The hooks, figs. 144 and 145, usually employed in this operation, are extremely delicate, and shaped in such a manner as to enable the operator to retain a firm hold upon the iris. The sharp instrument is usually objected to, on the ground that it is liable to endanger the lens, but with a little care everything of this kind may effectually be avoided.

Fig. 143.



Iris scissors.

Fig. 144.

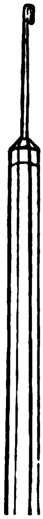
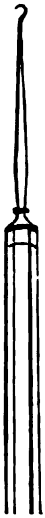


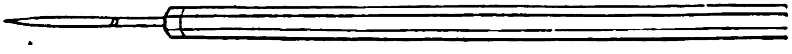
Fig. 145.



Iris hooks.

1. The operation by *incision* is commonly performed with a very delicate knife, or needle, with a double cutting edge, fig. 146, introduced through the sclerotica, at the usual place of entrance in the operation for cataract. The instrument having pierced the iris, at the point of election, is carried across the anterior chamber, so as to divide, either horizontally or vertically, and by a sort of sawing motion, the membrane in one-third of its extent, as represented in fig. 147. The knife must be extremely sharp, otherwise great difficulty will be experienced in making the aperture of the requisite dimensions. The success depends upon the amount of contraction of the muscular fibres of the iris; when this power is lost, as it often is after violent inflammation, the edges of the wound will not only not recede, but speedily unite, and thus effectually frustrate the intention of the surgeon. The same process is, therefore, obliged to be repeated, perhaps a number of times, and even then the result may be very unsatisfactory. For this reason, as well as because the operation always necessarily endangers the integrity of the lens, it has become nearly obsolete, although it cannot be denied that it now and then succeeds most beautifully, as it has done several times in my own hands.

Fig. 146.



Knife for artificial pupil.

Fig. 147.

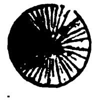
Operation by incision.

Another mode of performing this operation, one that is altogether preferable, because more certain in its execution and more satisfactory in its results, is to divide the cornea with a common cataract knife, to the extent of about three lines, and then cut through the iris with a smaller instrument.

2. The operation by *detachment*, fig. 148, consists in tearing away a portion of

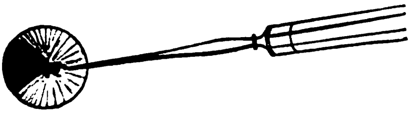
the iris from its ciliary connections; it is adapted chiefly to cases of great central opacity, and is never performed as a matter of choice, but of necessity. For reasons already mentioned, the artificial opening is not, if possible, placed at the upper margin of the iris. The operation is executed with a small cataract needle, curved rather abruptly at the point, which, being passed through the cornea, near its junction with the sclerotica, is pushed across the anterior chamber, and inserted into the periphery of the iris, which is then carefully separated from its connections to the extent of at least two lines. Great care must be taken to make the aperture larger than in the central operation, for, as the pupil is not in the line of the natural axis of vision, it will require a much greater number of rays of light to produce useful sight. Or, instead of the above operation, a small opening is made into the cornea, and a portion of the detached iris is drawn out by means of a hook, seen in fig. 149, between its edges, where it is permanently retained.

Fig. 148.



Operation by detachment.

Fig. 149.

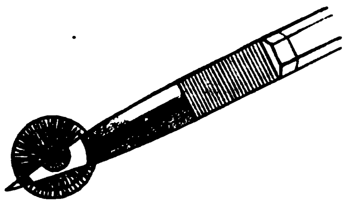


Operation by detachment.

3. The most unexceptionable procedure, however, of all is *excision;* it is, indeed, almost the only one that should be performed when we can have our choice, as it neither endangers the lens, nor is followed by closure of the artificial aperture. The cornea is divided as in the preceding case, when, if the pupil is not effaced, a blunt hook is passed round its margin, which is then drawn down and snipped off with the scissors; or, instead of this, the iris is brought down with a sharp hook, and a piece excised; or, finally, the membrane is seized as just stated, and a portion cut out with a pair of sharp-pointed scissors. Sometimes the iris protrudes as soon as the knife has left the cornea, and then the procedure is greatly simplified, as the required flap may be removed without introducing any instruments into the anterior chamber. In performing this operation, a great deal of care is necessary, lest we wound the lens, and thus provoke the formation of cataract.

Occasionally the cornea and iris are simultaneously divided, especially when there is permanent occlusion of the pupil, as in fig. 150. The requisite portion of the iris is then removed with the hook and scissors.

Fig. 150.



Simultaneous division of cornea and iris.

A knowledge of the methods now described will enable the surgeon to make such modifications as circumstances may demand. To attempt to give here even an outline of these modifications would be as tiresome as it would be useless. The whole subject of artificial pupil has been treated by the specialists in the most tedious and cumbersome manner, well calculated to disgust any sensible man with this branch of surgery. The fundamental principles being thoroughly understood, the details of each particular case may well be left to the judgment of the operator.

The *after-treatment* is extremely simple, essentially resembling that of cataract. Both eyes are carefully closed by strips of isinglass plaster, and half a grain of morphia is given the moment the patient is placed in bed, to insure the repose of the affected organ. The light is carefully excluded from the room, and the diet is strictly farinaceous for at least a week, when, especially if the person is old, or feeble, a little meat may be allowed, along with a glass of porter. The dressings are taken off at the end of the third day, to be renewed until all danger of inflammation is over. Exposure to light must be very gradual, for the eye remains long weak and predisposed to disease.

DISEASES OF THE CHAMBERS OF THE EYE.

The only affections of the chambers of the eye requiring special notice are dropsical accumulations, effusions of blood, and the development of hydatids.

1. A morbid accumulation of water, constituting what is called *hydrophthalmia*, may exist simultaneously in both chambers or be confined to one, more commonly the anterior. Dropsy of the anterior chamber is usually caused by inflammation of the membrane of Demours, a serous structure lining the cornea and the iris, both of which become more or less changed during the progress of the disease, the former being always abnormally prominent, and often somewhat nebulous, the latter dull and lustreless, with the pupil in a motionless and rather dilated condition. The ball is very hard in the earlier stages of the affection, but, as the dropsy advances, it generally becomes soft, and fluctuates distinctly under pressure. The patient, experiencing a sense of distension, but no pain, is annoyed by deceptive vision, and gradually loses his sight, which is occasionally completely destroyed. The disease is sometimes congenital, or, at all events, arises soon after birth.

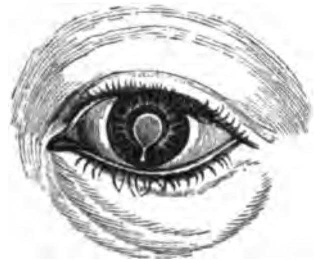
In posterior hydrophthalmia, there is always, or nearly always, a dissolved state of the vitreous humor; the eye is very large, hard, painful, and moved with difficulty; the sight progressively diminishes; the iris is pushed forwards into the anterior chamber; and the patient ultimately becomes completely blind. Of the causes of this form of dropsy nothing is known.

The prognosis in hydrophthalmia is extremely unfavorable, especially in the posterior variety. An attempt may be made at relief by frictions around the eye with mercurial ointment, and the use of minute doses of calomel, with an occasional hydragogue cathartic, counter-irritation behind the ears, and repeated evacuation of the fluid by means of a small puncture of the cornea. Rational, however, as this treatment apparently is, I have rarely derived any essential benefit from it.

2. In consequence of external violence, as a blow upon the ball, or spontaneous rupture of some of its vessels, an effusion of *blood* occasionally takes place into the chambers of the eye. In the female, it has been observed to occur as an effect of amenorrhœa, and in both sexes as a symptom of a scorbutic state of the system, attended with hemorrhage in other parts of the body. The fluid usually disappears in a short time by absorption; when the quantity, however, is inordinate, it may prove a source of irritation by its pressure upon the iris and cornea, and should then be evacuated by a small puncture through the latter membrane.

3. A species of *hydatid*, the cellular cysticerce of naturalists, has been met with, in a few rare instances, in the anterior chamber, floating about in the aqueous humor. It has hitherto been observed exclusively in young subjects, mostly under fourteen years of age, without any apparent cause. The animal is about the sixth of an inch in diameter, and, as seen through the cornea, looks, when fully unfolded, very much like a miniature balloon, as exhibited in fig. 151, being semi-transparent, and often quite brisk in its movements, retracting and protruding its head and body at pleasure. The consequence of the presence of such a body in the anterior chamber must, necessarily, be more or less impairment of vision, with a tendency to excite inflammation in the inclosing structures. On this account, it should promptly be removed by an incision through the cornea, the patient being under the influence of anæsthesia.

Fig. 151.



Cellular hydatid.

DISEASES AND INJURIES OF THE CRYSTALLINE LENS AND ITS CAPSULE.

CATARACT.

Cataract may be defined to be an opacity of the crystalline lens, of its capsule, or of both. In the first case it is called lenticular cataract, in the second, capsular, in the last, capsulo-lenticular. These distinctions are of great practical moment, as they exert an important influence upon the operations which are required for their cure. Cataract may be single or double, simple or complicated, traumatic or idiopathic, recent or old, mature or immature. The import of these terms is so evident as not to require explanation.

Of these different forms of cataract, the capsulo-lenticular is the most common, but of its relative frequency we have no knowledge. My conviction is that both the others are very rare, from the fact that one of these structures cannot be diseased for any length of time, or to any considerable extent, without the other participating in the morbid action. I presume, indeed, that, whenever the capsule is at all seriously affected, the lens must also speedily suffer, although the converse of this may not be true; cases occasionally occurring where the lens is completely opaque, and yet the capsule retains its transparency. Traumatic cataract is always capsulo-lenticular.

Cataract is a very common disease, liable to occur at all periods of life, from the moment of birth to the most profound decrepitude. Indeed, it occasionally exists as an intra-uterine affection. Although it may show itself at any age, experience has proved that the greatest number of cases are met with after the fiftieth year, or between that period and the sixty-fifth. Many cases also occur between the fortieth and fiftieth year. Children are comparatively exempt from it. The disease is often congenital. Cataract sometimes occurs in every member of the same family, as in an instance mentioned to me by the late Professor Drake, where as many as six children suffered in this way. Twelve years ago, a man brought to me three of his children, two sons and a daughter, on account of double cataract. Of his other six children, three were affected with strabismus. In another family, concerning which I was consulted more recently, four children out of six were the subjects of this disease, two having been affected with it from birth. Dr. Thomas J. Kennedy, of Tennessee, has communicated to me the particulars of a family consisting of six children, of whom three had congenital cataract. Of these, two were idiotic, while the other labored under hare-lip and cleft palate. Occasionally, again, the affection is hereditary, cases occurring in parents and their offspring for several successive generations.

Males are more frequently affected with cataract than females; but in what ratio has not been determined. The probability is that the number of cases would be nearly, if not quite, alike in both sexes, if both were equally exposed to the exciting causes of the disease; for it can hardly be supposed that the difference depends upon any other circumstance.

Causes.—Of the immediate causes of cataract very little is known. My belief has long been that the disease is generally developed under the influence of inflammation, leading to a deposit of fibrin or of fibrin and serum into the substance of the lens and its capsule. It is in this way only that we can account for the opacity which takes place in these structures, and upon which the disease in question essentially depends. When cataract forms very rapidly, it is probable that these parts are struck with a species of senile gangrene, from obstruction of the central artery of the retina, thus cutting off the supply of blood, and producing a change of nutrition. What lends support to this view is the fact that opacity of the lens occasionally exists, without any disease apparently of its capsule, whereas, disease of the capsule, especially of its posterior segment, is always promptly followed by a change of color of the inclosed structure. Now, it is well known that the capsule of the lens receives the ramifications of the central artery of the retina; and, although it is impossible to trace any of its branches into the lens itself, yet it is reasonable to suppose that some of them penetrate its substance. If we assume this to be the case, as I think we may, it is only necessary to imagine that these vessels are in a state of disease, and we shall thus have an easy explanation of the formation of cataract. When once the vascular connection of the lens and its capsule is destroyed, opacity is inevitable. Of this occurrence we frequently see examples in injuries of the eye, attended with lesion or displacement of the lens, which are invariably followed by cataract, and that generally in a few hours. In old people, in whom cataract is so very common, the disease is probably, at least at times, the result of a species of atrophy, dependent upon a gradual diminution of the supply of blood, and ultimately complete arrest of the circulation.

However we may explain the manner of its formation, cataract generally comes on without any assignable cause, the subjects of it being often in the most perfect health at the time of its appearance, as well as during its subsequent progress. Sometimes it is traceable to the effects of external violence, as a blow upon the eye, or injury upon the head. Wounds of the lens and its capsule, whether incised, punctured, or lacerated, are, as was before stated, always followed by cataract. Violent ophthalmia, especially when it involves the deeper structures of the eye, frequently leads to this disease, along with some of its worst complications.

There are certain circumstances which are generally regarded, though, perhaps, not with sufficient reason, as so many predisposing causes of cataract. Thus, it is said that cooks, blacksmiths, foundrymen, and persons of kindred pursuits, are particularly prone to the disease. It is also supposed that sempstresses, watchmakers, and other artists, whose eyes are constantly upon the stretch in viewing minute objects, are unusually liable to suffer from cataract. Without wishing to assert that these statements are wholly untrue, I have no hesitation in declaring that I have seen nothing to countenance them. Most of the cases of cataract that have fallen under my observation have occurred among farmers, mechanics, physicians, lawyers, and divines, who never injured themselves in this way, nor, so far as could be ascertained, in any other. Besides, the disease often occurs in infants and young children, at an age when such exposure is impossible. I have never seen cataract in a watchmaker, in a foundryman, or even in a literary man who sat up late at night by the flame of his lamp or gas-burner. I believe, therefore, that many of what are considered as predisposing causes of cataract exert no such influence, or only in a very remote degree. Of the effect of temperament upon the production of this disease we are totally ignorant; all that has been written respecting it is purely conjectural.

There is no question that the condition of the general system often exerts a powerful influence upon the production of cataract. I have repeatedly noticed the disease in persons of broken-down constitution; and Craigie, France, and others have published cases in which it was evidently caused by diabetes.

Cataract generally occurs in a very slow and gradual manner, several months usually elapsing before it exhibits the characteristics of maturity. Occasionally, however, it is developed with great rapidity. A case in which the disease formed in less than twenty-four hours was shown to me, in 1855, by Dr. John Bartlett, in the surgical ward of the Louisville Hospital, in an old man, a gardener by occupation. He first noticed that his sight was at fault in the morning, while at work in his grounds; it grew gradually more and more dim, and before night it was totally lost. An examination of the eye disclosed the existence of a well-developed cataract. The man was perfectly well at the time. He had lost the sight of the other eye by inflammation some years before.

The disease may begin simultaneously in both eyes, or one organ may suffer for a time, and then the other may become affected in a similar manner. There are cases, however, and they are by no means uncommon, in which the cataract is limited to one eye, the other escaping altogether, even if the patient survive the occurrence a long while. It is generally supposed that, when one eye is cataractous, the other will, sooner or later, become cataractous also, in consequence of their sympathetic connection; such an explanation, however, is obvionly altogether insufficient, and we shall probably be much nearer the truth if we ascribe the secondary affection to the same causes as the primary.

Morbid Anatomy.—Cataract varies much in its color, form, and consistence; so much, indeed, is this the case, that hardly any two instances of the disease are precisely alike.

The most common *color* of cataract is whitish, with various intermediate shades of grayish, yellowish, greenish, or brownish. The whitish appearance may be dull and lustreless, or of a shining, glistening, or pearly character, like the interior of certain shells, or the surface of a silver coin. A yellowish, cineritious, amber, or pale buff tint is sometimes observed, but not frequently. A greenish, olive, or bluish-gray hue is also rare, and is generally indicative of a complicated state of disease. A brownish cataract is very uncommon; and, as to the black variety of the affection, so much insisted upon by Beer and some other German authors, I have never seen an example of it, although its occasional existence is undeniable. The gold-leaf cataract, as it has been termed, also very infrequent, is characterized by its brilliant metallic aspect, caused by the presence of crystals of cholesterine.

The color of cataract is rarely uniform throughout the entire extent of the diseased structure; on the contrary, it is generally a shade or two darker at the centre than at the circumference. Cases occur in which the lens has a radiated, spoke-like, or stellar disposition, caused simply by the lines which produce this appearance being of a darker color than the intervening substance.

The capsular cataract is often a few shades lighter than the lenticular, and is also generally of a more uniform color. It has sometimes a speckled, dotted, or punctiform appearance. According to the researches of Dr. Stellwag, of Vienna, the opacity in this form of cataract is not seated in the substance of the capsule, but in the matter deposited upon its internal surface. This matter, which can be detected only with the aid of the microscope, is either of an earthy or a fatty nature, and is the cause of the mottled appearance in capsulo-lenticular cataract.

In its *consistence*, cataract varies from that of milk to that of cheese, fibro-cartilage, cartilage, and even bone. A fluid cataract, properly so called, is very uncommon; I have seen only a few cases of it, and in those the lens was so soft that its contents escaped and diffused themselves through the aqueous humor the moment the needle penetrated the capsule. The fluid cataract has usually a hard nucleus, especially when the disease is comparatively recent. In general, the consistence of the lens is equal to that of jelly, curds, a thick solution of isinglass, or the white of a soft-boiled egg. The hard cataract exhibits numerous varieties. Thus, it may be of the solidity of hard cheese, cartilage, bone, chalk, or earthy matter, very dry, inelastic, and incompressible. Capsular cataract is generally more or less tough, especially when old, and indisposed to yield under the pressure of the needle. It is worthy of note that an opaque lens is usually a few shades darker in the eye than it is after it has been extracted.

The *size* of a lens, in a state of opacity, may be natural, augmented, or diminished. An increase of volume is most common in young subjects; elderly persons, on the contrary, have more frequently atrophy of the lens. In congenital cataract, or cataract coming on soon after birth, the lens is often completely destroyed, or so much wasted that it may be said to exist only in a rudimentary state. The capsule, in such a case, either retains its normal volume and shape, or it is shrivelled into a small, tough, and irregular mass, hardly as large as a currant.

A form of cataract, to which the term *lamellar* has been applied, has recently excited a good deal of attention. It was first noticed by Jaeger, and was afterwards well described by Graefe. A short but graphic paper on the subject, setting forth the peculiar nature of the disease, was published by my friend Dr. E. Williams, of Cincinnati, in the North American Medico-Chirurgical Review, for September, 1857. It is most common in children under seven years of age, and essentially consists in a circumscribed opacity of a thin lamella of the lens, the periphery and central nucleus of which generally retain their natural transparency. Its progress is usually very slow, and it frequently happens that it remains completely stationary for years, if not during the rest of life.

Cataract may exist as an independent affection, or it may be associated with other lesions. In the idiopathic form of the disease the different structures are generally healthy; but when it has been caused by inflammation or external injury, it is often associated with disease of the cornea, iris, choroid, and retina, which thus seriously complicates the capsulo-lenticular malady, and exerts an unfavorable influence upon the prognosis. The general health may be perfectly natural, or variously altered; and this circumstance, again, may materially affect the issue of our curative measures.

Fig. 152.

Cataract.

Symptoms.—Cataract usually manifests itself as an opaque speck immediately behind the pupil, in the centre or at the periphery of the crystalline lens from which it gradually extends, until the whole of this body is of a whitish, milky, grayish, or drab color, as in fig. 152. Sometimes the affected part, instead of being distinctly opaque, has merely a nebulous appearance, as if it were suspended in the interior of the lens; at other times the opacity shows itself simultaneously at every point, though not with equal distinctness. The pupil is generally natural, and readily dilates and contracts under the influence of the light, its free margin forming a dark circle immediately in front of the cataract. The iris is unchanged in its shape, unless the diseased lens is unusually large, when it may be pushed a little forwards, and thereby rendered slightly convex. The cornea and aqueous humor retain their normal characters.

During the formation of cataract, the patient is conscious of impairment of vision, usually very slight at first, but gradually augmenting in proportion to the increase of the opacity of the lens and its capsule. He sees objects indistinctly, and, as it were, through a veil, haze, or mist; his sight is better in cloudy weather than in clear, and in twilight than in the bright sun, because the pupil, being then more dilated, admits a greater amount of light. In general, too, he can discern objects more distinctly by looking at them laterally than when they are placed directly in front of him. This is owing to the fact, already adverted to, that the opacity of the lens is generally greater at the centre than at the periphery, thus still permitting a certain quantity of light to come in contact with the retina. It is for the same reason that the sight is always temporarily improved by dilating the pupil with atropia. The formation of cataract is unattended with pain, intolerance of light, lachrymation, or disorder of the general health; and hence, but for the gradual loss of sight, the patient would not be at all aware of the existence of the disease.

In elderly subjects the starting-point of the opacity is generally the periphery of the lens, or of the lens and its capsule, from which it gradually extends towards the interior until the whole mass is involved in the morbid action. In congenital cataract, on the contrary, it nearly always commences at the centre of the lens, as a grayish-white, faintly striated object, the lines passing outwards towards the circumference, which often retains its transparency during adult life. Sometimes the opacity originates as a minute dot, or a little obtuse cone, of a milky whiteness, in the superficial portion of the lens, just behind the capsule. Not unfrequently the whole lens is absorbed, its envelop alone remaining, usually, in a very shrunken, indurated condition.

Cataract in children prior to the age of puberty is very uncommon; when it does occur it is usually the result of injury, or of a congenital vice, which escaped the observation of the surgeon, the defective vision having been ascribed to the effect of shortsightedness.

Traumatic, like senile cataract, is, at the beginning, nearly always cortical, but, in certain forms of injury, the opacity may occur simultaneously on the surface and at the centre of the lens. The disease, in either event, progresses very rapidly, and the lens, brought in contact with the aqueous humor, is speedily absorbed, with the exception, perhaps, of a small portion, which, gradually undergoing the fatty and earthy degeneration, ultimately shrinks into a flattened, disc-like, mottled, or dead white body, observable deep behind the pupil. The capsule, on the contrary, is seldom, if ever, completely absorbed; instead of this, it contracts firmly round the remnant of the lens, at the same time that it becomes very tough, and coated with earthy, fatty, and inflammatory matter. When the entire lens has been removed, the capsule generally rolls itself up into a hard, dense, white body, often of a ring-like shape, which either floats about behind the pupil, adheres to the iris, or sinks down into the posterior chamber, where it can be detected only when the pupil is widely expanded by atropia.

Diagnosis.—The only affections with which cataract is liable to be confounded are amaurosis and glaucoma. From these, however, it may, in general, be readily distinguished by the following circumstances, placed, for the sake of greater clearness and more easy reference, in tabular form:—

CATARACT.	AMAUROSIS AND GLAUCOMA.
1. Impairment of vision is gradual, several months generally elapsing before it is completely lost.	1. Vision fails rapidly, and is often lost in a few days or weeks; sometimes, indeed, in a few hours.
2. The opacity begins either at the periphery or at the centre of the lens; it is superficial, comparatively well defined, and of a grayish, whitish, yellowish, or pearl color. It is seen equally well, whether the eye is viewed sideways or directly from before backwards.	2. It begins simultaneously at different points, is deep-seated, diffused, indistinct, and of a bluish, greenish, or azure hue. It is seen most satisfactorily when we look directly into the eye, not laterally.
3. The pupil is natural, with a dark circle, and promptly obeys the influence of the light: it also readily expands under the application of atropia.	3. The pupil is widely dilated, insensible to light, and without any marginal circle. It dilates slowly and imperfectly, if at all, under the influence of medicine.
4. Vision is best in cloudy weather, in twilight, in shady places, and when the back is turned towards the light. It is also increased under the influence of atropia.	4. The patient sees objects most distinctly in a bright light, and in a particular direction, owing to the fact that the retina often remains sound for some time at one or more spots. No improvement of vision follows artificial dilatation of the pupil.
5. Cataract forms without pain, headache, intolerance of light, or constitutional disorder.	5. In amaurosis and glaucoma, there is often, if not generally, hemicrania, with neuralgia in or about the eye, sick headache, and other marked evidence of gastric and general derangement.
6. In cataract, there is merely a mist or haziness before the eye, with a distorted appearance of objects.	6. In amaurosis and glaucoma, objects of the most grotesque appearance are constantly floating before the eye, and the patient is annoyed with scintillations or flashes of light.
7. The sight is seldom entirely destroyed, however protracted the disease.	7. Completely lost in the confirmed stage of the disease; prior to this, it is often alternately better and worse, in consonance with the condition of the general health.
8. The expression of the countenance is comparatively natural and cheerful; the only perceptible change in the eye is the pupillary opacity.	8. The countenance has a singularly vacant appearance, and the eye looks as if it were dead.
9. The eyeball retains its natural consistence.	9. In amaurosis and glaucoma, the ball is often very soft, so that it may almost be indented with the point of the finger.

Much stress has been laid by some writers upon the value of the *catoptric* test, as a means of diagnosis in cataract. It consists in holding a lighted taper before the eye, the pupil being previously dilated, and the examination being conducted in a dark room. If the cornea and lens are in a sound condition, three images will be perceived, two being erect, and the middle, or intermediate one, inverted. Of these images, the anterior is produced by the cornea, and is most distinct; the posterior depends on the anterior surface of the lens, and is comparatively faint; the central is caused by the concave surface of the posterior wall of the capsule, and is the smallest of all. If the taper be moved, the two erect figures follow the light, but the inverted passes in the opposite direction. Now, in cataract, the middle one will be found, even at an early stage of the disease, to be very obscure, if not altogether absent, and the deep, erect one very indistinct. In pure amaurosis, the three images of the candle are quite distinct. In glaucoma, on the contrary, especially in its more confirmed stages, the inverted one is obliterated.

It is remarkable that any surgeon, however ignorant, should ever mistake opacity of the cornea for cataract; such an occurrence would hardly seem credible if I had not repeatedly witnessed it. I have, again and again, had patients sent to me from a great distance by men who ought to have known better, on account of supposed cataract, which, upon inspection, proved to be nothing but a white speck upon the cornea, the result of former inflammation. Such errors are highly disreputable, since any one with the slightest knowledge or experience cannot fail, with proper care, to arrive at a correct diagnosis, and that, too, without the aid of the catoptric test and of the ophthalmoscope, at present so much employed by professed oculists as means of exploration.

The diagnosis of cataract will be greatly facilitated by the application of atropia, which, by dilating the pupil, enables us to observe the condition of the lens, and to determine the site of the opacity, as well as its nature and extent. Useful information in regard to the consistence of the cataract may generally be obtained by a consideration of the age of the patient, the duration of the disease, and the color and size of the opaque body. The cataract of infancy is frequently capsular, or, if any portion of lens remains, it is quite small; in children and young subjects, the lens is generally soft; in elderly persons, on the other hand, it is nearly always hard. A very white or pearl-colored cataract is ordinarily soft; so, also, a cataract of unusually large volume. The very hard cataract is commonly small, and of a yellowish, drab, or amber hue. A recent cataract is generally soft; an old cataract, hard. To these rules, however, there are, as might be expected, numerous exceptions, which should have due weight in our attempts at the establishment of a correct diagnosis.

In congenital cataract both eyes are usually affected, and there is nearly always a peculiar oscillatory movement, termed nystagmus. This, however, may accompany ulceration and opacity of the cornea, and is, therefore, unreliable as a diagnostic. In encephaloid, almost the only disease with which congenital cataract is liable to be confounded, the morbid growth begins in the retina, or, at all events, deep behind the vitreous humor, and is invariably limited to one side.

Traumatic cataract is sometimes difficult of detection on account of injury sustained by the cornea, iris, and sclerotica; in general, however, the history of the case, and the nature of the opacity will sufficiently indicate its character. When the disease is of long standing, the anterior surface of the cataract is occasionally covered by a blackish speck, caused by a deposit of pigment from the posterior surface of the iris. Such an appearance, which might readily mislead an inexperienced observer, can only be detected by a careful exploration with the ophthalmoscope. A brown or black cataract is usually very difficult of diagnosis.

In capsular cataract, attended with complete destruction of the lens, the opaque membrane is generally remarkably shrivelled and irregular, and of a dead chalky color; it is either partially adherent to the iris, as in the congenital form of the disease, or it floats about in the posterior chamber, as a small, dense body, often difficult of detection without the aid of atropia and a concentration of light by means of a convex glass. The posterior portion of the capsule is less frequently cataractous than the anterior. Partial opacity may coexist with a healthy lens; but in the complete variety of the disease the lens always participates in the morbid action.

The most important symptoms of *lamellar* cataract are nearsightedness and a peculiar expression of the features, so commonly attendant upon partial blindness. The diagnosis, however, can seldom be satisfactorily determined without ophthalmoscopic inspection.

What is called a *false cataract* is merely a layer of plastic matter, in a state of organization, which either completely fills the pupil, or which is stretched across the orifice from one point of its margin to another. The opacity is immediately within the pupil, which is, at the same time, generally considerably contracted, and perfectly immovable, even, perhaps, under the influence of atropia. Vision is more or less impaired, if not completely destroyed, the light being unable to reach the retina.

Treatment.—When cataract has once commenced to form, no remedies, or mode of treatment, can arrest its progress; on the contrary, it will be sure to advance until the opacity is complete, and vision is almost entirely lost. Should one eye alone be originally affected, the other is extremely liable to become affected also; whether from sympathy, or from the same causes which occasioned the disease in the first instance, experience has not determined. The result of operation, which alone can prove of any benefit in curing the disease, will be influenced by a great variety of circumstances, among which the most important are the state of the patient's health, the presence or absence of complications, and the amount of inflammation consequent upon the interference. Infancy and old age are no bar to surgical interference or its success; I have repeatedly operated, with the most happy effect, within the first six weeks after birth, and also upon subjects after the seventieth year. Indeed, in three cases I have succeeded in restoring excellent vision at eighty, eighty-two, and eighty-three. My opinion is that season exerts no special influence upon the result of the operation, and I therefore never postpone it on account of the state of the weather.

A spontaneous cure of cataract is possible, but certainly extremely uncommon. One such case was reported in the Maryland and Virginia Medical Journal for February, 1861, by Dr. Peachy, of Richmond, the patient being a man fifty-four years of age. The lens, apparently hard, and of an amber color, escaped into the anterior chamber of the eye, below the axis of vision, where it underwent complete absorption, followed by perfect restoration of the sight. The disease had existed for many years.

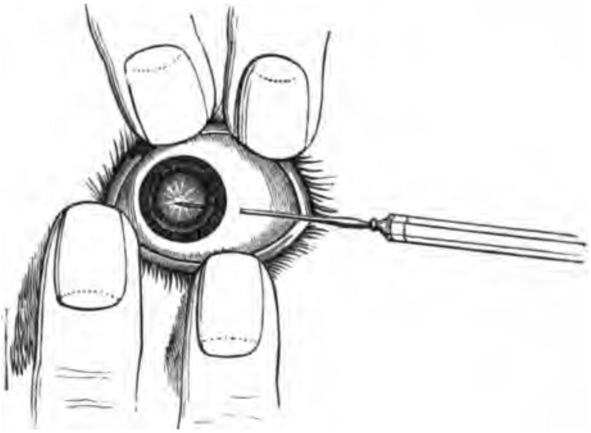
It is customary with all surgeons to subject their cataract patients to a certain amount of treatment before they have recourse to operative interference. Such an expedient cannot be too highly commended. It is particularly necessary in middle-aged and elderly subjects; not so much so in children and young adults; while in infants at the breast it may, in general, be altogether dispensed with. The extent of this preliminary preparation of the system must depend upon circumstances. If the patient is otherwise perfectly healthy, it need not be carried beyond the observance of rest and light diet for a week or ten days, and the administration of one or two very mild purgatives; under opposite circumstances, however, a longer ordeal may be called for. This is particularly true when there is a rheumatic or gouty state of the system, a disposition to neuralgia, or a tendency to inflammation of the eye. When this is the case, it is hardly possible to be too careful respecting the preliminary treatment. For the want of proper attention to this point I have seen more than one eye lost. In general, it is advisable not to operate until it is certain that the secretions are in the most healthy condition, and that all tendency, if any exists, to inflammation of the eyes has disappeared. If the individual is inordinately plethoric, he may be bled once at the arm, and take an active cathartic every other night for a week before the operation. When a gouty or rheumatic predisposition exists, a preliminary course of colchicum may be necessary, and, unless the case is very urgent, interference should be postponed until warm weather sets in, as there will then be less likelihood of an attack of the disease.

It is a good rule not to operate so long as one eye only is affected; for the reason that, if violent inflammation should arise, it may extend to the sound organ, and thus jeopard the safety of both. Besides, even if there were no risk of this kind, which, I think, has been much exaggerated, but the result be ever so favorable, still, the eyes, not being in the same focal condition, could not enjoy a similar amount of vision, and therefore the patient might, at least for some time, be worse off than before, although he had got rid of the opacity of the lens, and the consequent disfigurement of the part. Such operations are operations of expediency, and their performance is always of questionable propriety. In case, however, cataract exists in both eyes, although only in an incipient degree in one, the rule is to operate upon the bad eye now, and at some future period, when the sight shall have more declined, upon the other. What should be the rule of conduct when both organs are affected in an equal degree, or when the person is nearly or totally blind? This question has been answered differently by different writers. For my own part, I never hesitate to attack both eyes at the same sitting, believing that there is no more risk than when we operate only upon one organ, while the procedure has the great advantage of obviating protracted confinement and mental anxiety. I do not think that I have ever had cause, in a solitary instance, to regret this step.

Although the *operations* which have been devised for the cure of cataract are quite numerous, they may all be referred to three principal methods, displacement, division, and extraction. As these methods are not equally adapted to all cases, much judgment is often required in regard to their particular application. Thus, it may be stated, as a general rule, that extraction can be practised only when the cataract is hard, and division when it is soft. A hard cataract may also be depressed, but not a fluid one. Age likewise influences the choice of the operation. In infants and children we never extract, but limit ourselves to couching and laceration.

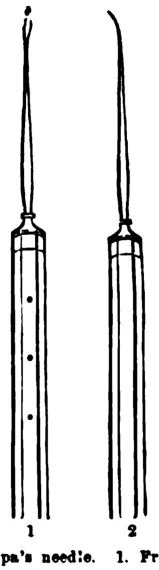
1. *Division of the Lens.*—Division of the cataract, or the operation by solution, consists, as the name implies, in cutting the opaque lens and its capsule into numerous pieces, and pushing them forwards into the anterior chamber, in order to subject them more effectually to the influence of the aqueous humor. The pupil is thoroughly dilated by atropia, and the lids are disposed in the manner exhibited in fig. 153, the patient sitting upon a chair with the head well supported by an assistant. The needle which I generally employ is one of remarkable delicacy, perfectly straight, and sharp-pointed. Some surgeons prefer a curved instrument, as that of Scarpa, represented in fig. 154; but I have not been able to satisfy myself that it possesses any advantage over, if indeed it is equal to, the straight. Whatever may be its shape and size, it should be introduced at least two lines and a half behind the cornea, a little below the horizontal diameter of the eye, in order to avoid the long ciliary artery; the point should then be directed forwards in front of the lens and its capsule, which are now pierced and thoroughly comminuted, care being taken, before the instrument is withdrawn, to push as many fragments forwards as possible through the dilated pupil into the anterior chamber. The object of the whole proceeding is to bring the opaque structures, after they have been properly divided, under the influence of the aqueous humor, and

Fig. 153.



Operation of solution.

Fig. 154.

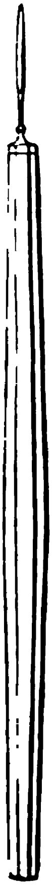


Scarpa's needle. 1. Front view. 2. Side view.

the more effectually this is done the more rapidly will they be dissolved. It is still a mooted point whether the aqueous humor really possesses any solvent power or not, or whether the disappearance of the cataract is not entirely due to the action of the absorbent vessels of the membrane of Demours. When we take into consideration the fact that pieces of cataract, both lenticular and capsular, which float about in the aqueous humor, often vanish in a very short time, without any but the most casual and transient contact with the structure here adverted to, it seems difficult to deny to this fluid such a property, although we may not be able to discover where it resides, seeing that it is composed essentially of water and a little saline matter, which are destitute of such properties out of the body.

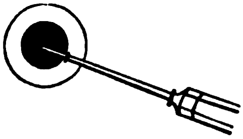
Dr. Hays, of this city, who has much experience as an ophthalmic surgeon, has devised an ingenious instrument for cutting up hard cataracts, and experience has shown that the operation is generally followed by the most gratifying results. The instrument, which is here represented of the natural size, fig. 155, combines both the advantages of a knife and a needle; it is very acute at the point, and has a double cutting edge, a little over four lines in length on one side, but much less on the other. The whole arrangement bears a very close resemblance to that of an iris-knife. The instrument is introduced in the usual manner, and brought in contact with the anterior surface of the opaque lens, which, together with its capsule, is then freely lacerated and divided in front, in order that the remainder of the body may be fully exposed to the action of the aqueous humor, and so become softened and ultimately absorbed. If this be slow in taking place, another operation is performed. If the cataract is comparatively soft, the whole of it may be completely divided at the first sitting. The pupil should be well dilated at the time of the operation, and, also, for some days afterwards.

Fig. 155.



Hay's knife-needle.

Fig. 156.



Keratonyxis.

There is another method of performing this operation, in which the needle is introduced at the lower part of the cornea, as in fig. 156, and made to act upon the capsule and lens through the anterior chamber. This is called the operation of *keratonyxis*, or, simply, the anterior operation. The pupil being widely dilated, the head and eyelids are secured as in the more ordinary procedure, when the cataract is freely divided with a very delicate needle, either straight or slightly curved, as many of its fragments as possible being brought forwards in front of the iris. The instrument must be inserted near the outer border of the cornea, so that the resulting inflammation, if severe, may not lead to any injurious opacity, interfering with the transmission of light. I have performed this operation only a few times, and the result was such as to induce me to form rather an unfavorable opinion of it, as I found it to be not only awkward of execution, but followed by too much excitement, at the same time that it does not possess, so far as I can perceive, any superiority over the posterior method.

In performing this operation, portions of hard cataract sometimes fall accidentally into the anterior chamber, or are pushed there designedly, and cause injurious pressure upon the cornea in a manner similar to any ordinary foreign body. To save the eye, in such a case, from destructive inflammation, recourse should at once be had to linear extraction, by making an opening, not more than the sixth of an inch in extent, through the lower and outer part of the cornea. Removal of the offending substance is readily effected by the scoop or forceps.

The operation by solution is admirably adapted to the cataract of infants and young children. The patient, being under the influence of anæsthesia, is supported upon the lap of an assistant, or, what is preferable, his head is placed between the surgeon's knees, while the body and limbs are held by a second person. If the exhibition of chloroform is undesirable, the little child is wrapt up tightly in an apron, as in the operation for hare-lip. This precaution is indispensable to the success of the undertaking. In other respects, the proceeding is the same as in the adult.

The question is often asked, At what age is it proper to interfere in cases of congenital cataract? To this I unhesitatingly reply, at any period, provided the eye and general system are in a sound condition. I have repeatedly operated upon children under six months, and once upon an infant hardly four weeks old, with the most gratifying results. Indeed, I have never, except in a solitary instance, and then I did not have charge of the subsequent treatment, seen anything like active inflammation after the operation, however early performed. My experience is that children, in general, bear this kind of meddling much better than grown persons, their nervous system, although easily shocked, recovering much sooner from the effects of the operation than adults.

The operation of *drilling*, devised by Mr. Tyrrell, of London, is a modification of keratonyxis, and is sometimes employed in false cataract, or in ordinary cataract attended with great contraction of the pupil, or contraction of the pupil and adhesion of its edges to the anterior surface of the lens. It is executed by carrying the common straight needle through the cornea, and thence on across the pupil, into the centre of the opaque lens, which is then perforated in such a manner as to admit the aqueous humor. The process is generally obliged to be repeated from four to eight times before a sufficient tunnel is obtained for the transmission of light for useful vision. Such an operation is of questionable utility, and might, I should suppose, be advantageously replaced, in every case, by the posterior procedure; for, besides the awkwardness attendant upon its performance, its frequent repetition is well calculated to lead to serious, if not destructive, inflammation.

2. *Displacement of the Lens.*—In the operation by displacement, more commonly called couching or depression, the lens is removed from the axis of vision, and buried in the substance of the vitreous humor. The pupil being widely dilated, the patient's head properly steadied, and the lids held out of the way, a curved needle, very delicate, and somewhat spear-shaped, is pushed across the coats of the eye, at least two lines and a half behind the cornea, and carried carefully forwards until the point becomes visible in front of the cataract, as in fig. 157. The point being now applied against the lens, this is next pressed downwards and backwards into the vitreous humor beyond the axis of vision, and out of reach of the retina and the ciliary processes, as shown in fig. 158. The needle, being disengaged, is retained for a few seconds in the eye, to ascertain whether or not the cataract is disposed to rise; if it is, it is again depressed, and now

Fig. 157.

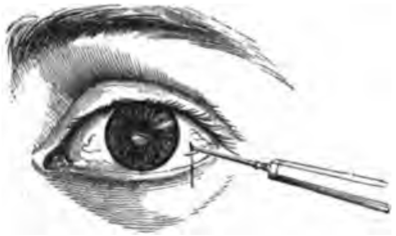
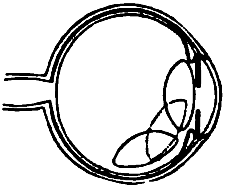


Fig. 158.



Depression of cataract.

with still greater care. It is not necessary, as some surgeons seem to think, to lacerate the anterior segment of the capsule as a preliminary step in this operation; on the contrary, it is decidedly preferable, whenever this is practicable, to dislodge both lens and capsule at the same time. Where this precaution is neglected, there is danger that a portion of this membrane will remain, and afterwards act obstructingly.

Two circumstances are absolutely necessary to insure the successful execution of this operation, a certain degree of firmness of the cataract, and a tolerably healthy condition of the vitreous humor. If the lens is soft, it cannot be depressed; and, on the other hand, if the vitreous humor is fluid, or partially dissolved, it will afterwards be impossible to prevent the lens from rising.

The result of depression is liable to be marred by the occurrence of retinitis; and the possibility of such a contingency is not limited to the first few days or weeks after the operation, but may take place a long time after the patient has completely recovered from its immediate effects. The cause of this occurrence is the pressure which the displaced lens exerts upon the retina and the ciliary processes; and hence, as already intimated, the surgeon cannot be too cautious in guarding against it in performing the operation. This, however, unfortunately, will not always be a sufficient guarantee against it; for it is well known that the weight and pressure of the lens, even when this body is originally most eligibly situated, may gradually bring about a dissolved condition of the vitreous humor, and thus force it in direct contact with the delicate and important structures here referred to. Such contact, no matter when it may arise, will inevitably excite inflammation of the retina, followed by complete disorganization of its substance, and, consequently, total loss of sight. There is reason to believe that the lens, if not too hard, ultimately disappears after this operation, if not wholly, at all events, all but its central and more compact portion; but cases are met with, as dissection has demonstrated, in which it nearly all remains, much to the detriment of the part and system. For these reasons the operation should, I think, be discarded from practice.

For many years past, I have been in the habit of performing a *mixed operation* for cataract, consisting of a combination of division and couching. The procedure, as the name implies, is executed by breaking up the outer and more fluid portions of the opaque lens, and burying the remainder in the substance of the vitreous humor. It is, consequently, not adapted either to the very soft or to the very hard cataract, but to a union of the two; an occurrence sufficiently frequent to render the operation one of no little importance. Not having preserved a record of my cases, I am not able to state how often I have performed this operation, or with what results; I am, however, positively certain that it has never been productive, in my hands, of violent, much less of destructive, inflammation, and that in nearly every instance the patient obtained good vision. The pupil is dilated, as in the ordinary procedure, and everything else is precisely similar.

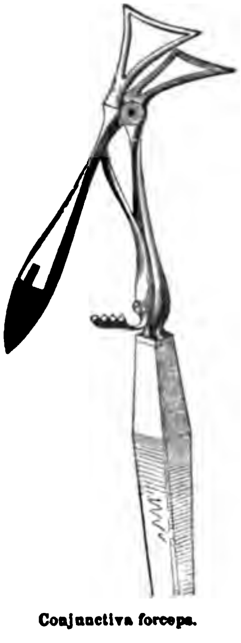
I do not deem it necessary to describe the operation of *reclination*, as it is termed, a modification of the ordinary process of displacement, inasmuch as it is now obsolete. I have myself never performed it, but the cases of it that have fallen under my notice have all speedily terminated in total blindness.

3. *Extraction.*—Extraction is a much nicer and more delicate procedure than that of depression or laceration; it requires great coolness and dexterity on the part of the surgeon, and the most thorough co-operation on the part of the patient, for its successful execution. It is said of Wenzel that he spoiled a whole hatful of eyes before he had learned the art of extracting. This statement, without being strictly true, affords an excellent illustration of the difficulties which attend this operation, and a reason why so few practitioners are found who are ready and willing to undertake it.

Extraction is adapted only to certain forms and conditions of cataract. Thus, it is absolutely necessary that the cataract should be hard; that there should be a very convex cornea, and a sound pupil; and, lastly, that the eye should not be situated too deeply in its socket, or, what is the same thing, that there should not be too prominent an arch, interfering with the requisite manipulation in performing the operation. When the reverse of these conditions obtains, extraction of the lens will either be wholly impracticable, or attended with so much risk as to render the attempt improper, if not unjustifiable. Infancy and childhood are also bars to the operation. When well executed, and all the pre-existing circumstances are propitious, it is the least objectionable operation of all; the whole of the opaque body is disposed of at a single sitting, the corneal wound generally heals by the first intention, and there is no danger either of immediate or secondary injury to the internal structures of the eye. On the other hand, if the greatest precaution is not exercised, there may be a sudden and unexpected escape of the different humors of the organ, followed by complete collapse, or the eye may be destroyed within the first few days by inflammation. The latter risk, however, is shared by this operation in common with that of depression and of laceration.

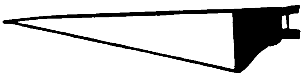
In performing the operation, the patient may either sit upon a chair, with his head reclining against the breast of an assistant, and held perfectly quiet; or, what I always prefer, lie upon a lounge, sofa, or narrow bed, the head and shoulders being properly supported by pillows, so as to render the former almost horizontal. If the patient is very timid or nervous, I do not hesitate to place him under the influence of chloroform, satisfied that the risk of losing the eye by vomiting is an extremely remote and improbable one. The pupil is not dilated as in depression and laceration. The upper lid is raised by an assistant, with the precaution of not pressing upon the eye, while the globe is fixed by seizing hold of a fold of the conjunctiva a quarter of an inch below the cornea, with the instrument sketched in fig. 159, and which also depresses the lower lid. Or, instead of this, and what will answer quite as well, a pair of ordinary pocket forceps may be used, the nibs, which should be rather broad, being gently pressed against the sclerotica a short distance below the cornea. The eye is now drawn somewhat down, when the surgeon, armed with a Beer's knife, represented in fig. 160, to which I generally give the preference, inserts the point—supposing he is operating upon the left organ—into the cornea within a third of a line from its junction with the sclerotica, and a short distance below the horizontal equator. In executing this step of the operation, care must be taken to hold the instrument nearly vertically, otherwise we shall be apt to get between the lamellæ of the cornea, instead of puncturing this membrane, as is our intention. Seeing now the point of the knife in the anterior chamber, it is carried carefully and slowly

Fig. 159.



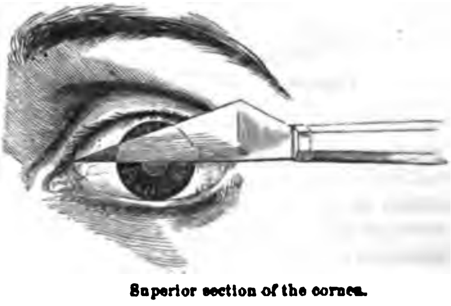
Conjunctiva forceps.

Fig. 160.



Beer's knife.

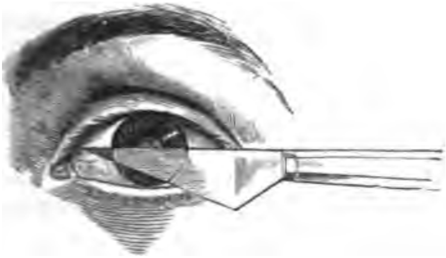
Fig. 161.



Superior section of the cornea.

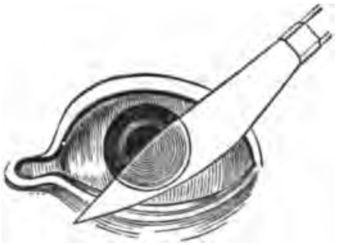
across towards the opposite side, in front of the iris, and brought out in such a manner as to divide fully one-half of the cornea, either at its upper, lower, or

Fig. 162.



Internal and inferior section of the cornea.

Fig. 163.



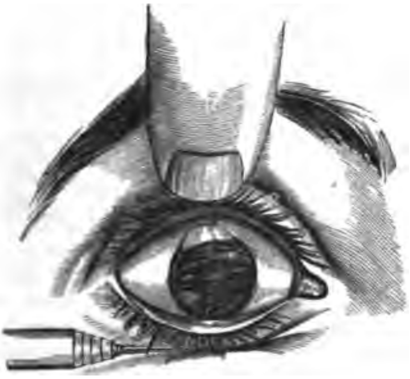
External and inferior section of the cornea.

infero-external aspect, as may be most convenient; for, in point of utility, it really does not matter which, though the upper section is usually preferred. The extremity of the knife issues at the same distance precisely from the sclerotica as that at which it entered. These several procedures are represented in figs. 161, 162, and 163.

The section of the cornea being completed, the eye is immediately liberated, and permitted to conceal itself behind the lids, in order to enjoy a moment's repose.

The next step of the operation consists in gently separating the upper lid, with a view of ascertaining whether the lens has any disposition to advance across the pupil. If it has, its expulsion is promoted by slight pressure upon the ball of the eye with the handle of a knife or the end of the index finger Should this fail, the surgeon then introduces a delicate hook, represented in the accompanying cut, fig. 164, and lacerates the central portion of the capsule; the lens, being thus liberated, now issues of its own accord, or, at all events, with the aid of a little friction upon the globe. Fig. 165 represents the lens as it is passing through the wound in the cornea.

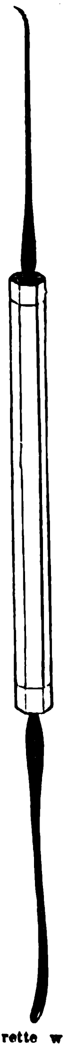
Fig. 165.



Lens passing through incision of the cornea.

The third and last stage of the operation consists in replacing the iris, should it be prolapsed, in re-adjusting the flaps of the cornea, and in confining the lids by means of several strips of isinglass plaster, with the twofold object of keeping them quiet and of preventing the introduction of the light. A light bandage, or, what is better, a very thin handkerchief, carried round the head, completes the dressing.

Fig 164.

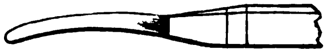


Curette with silver scoop.

Several accidents are liable to happen during this operation, which the surgeon should take great care to avoid.

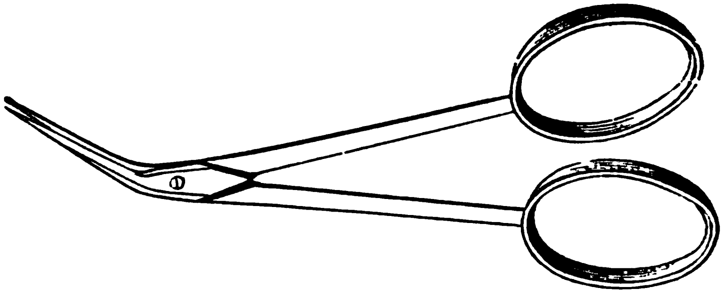
1st. The point of the knife may become entangled in the iris in making the section of the cornea; should this happen, the instrument must be disengaged, but not withdrawn, and the iris stimulated to contraction by gentle friction upon the cornea. This failing, the knife is laid aside, and the division completed with a probe-pointed bistoury, fig. 166, or a pair of scissors, fig. 167, one blade of which is blunt at the end. The flap, as already stated, should comprise fully one-half of the circumference of the cornea.

Fig. 166.



Curved cornea knife.

Fig. 167.



Probe-pointed scissors.

2d. There may be prolapse of the iris; this occurrence is by no means unusual, and is generally easily remedied, replacement being readily effected with a small probe.

3d. There may be an escape of the vitreous humor, followed by partial or complete collapse of the globe. This may be occasioned simply by the involuntary action of the muscles of the eye, and, therefore, be wholly beyond the control of the surgeon; or it may be caused by too free a section of the cornea, or by inadvertent pressure upon the globe. However induced, the eye should instantly be closed, and after having a brief period of repose, the parts should be re-adjusted, as under ordinary circumstances.

4th. The capsule may remain, the lens alone escaping, and thus rendering the cure imperfect. The proper plan, in such a case, is either to extract the capsule on the spot, or to dispose of it with the needle, when the eye shall have recovered from the immediate effects of the operation.

5th. The extraction is sometimes followed by intra-vascular hemorrhage, dependent upon the rupture of some of the vessels of the choroid. The blood is generally of a venous character, and, as it escapes, it usually displaces the vitreous humor, forcing it out of the eye, and thus completely defeating the object of the operation, besides inflicting severe suffering upon the patient. The immediate effects of the accident are faintness, nausea, and agonizing pain, seated deeply in the ball of the eye, and radiating through the forehead, nose, and temples, the lids being so exquisitely sensitive as to render the slightest touch almost insupportable. Inflammation, often of a destructive character, soon follows, and greatly aggravates the distress. The treatment should consist of cold applications to the eye, the copious abstraction of blood, and active purgation, with elevation of the head and the careful exclusion of light.

4. *Linear Extraction.*—This operation, devised by Gibson in 1811, modified soon after by Travers, and lately revived in Germany, consists in making a small incision through the outer and lower part of the cornea, from the eighth to the sixth of an inch in extent, in freely dividing the capsule and lens with a fine cutting needle, and in removing the fragments after they have been brought into

the anterior chamber, with a scoop. If thorough comminution has been effected, most of the fragments will probably be washed away by the aqueous humor, as it gushes through the wound; if not, they should be carefully extracted, unless they are very small, when they may be left in the hope of being speedily absorbed.

Linear extraction is, of course, applicable only to soft cataract, and recommends itself by the facility of its execution, the little risk of inflammation, and the rapidity with which it affords relief. Chloroform may be administered if the patient is unusually timid or unruly. Great care should be taken not to injure the iris or to contuse the edges of the wound in the cornea.

A modification of this operation was proposed, in 1859, by Dr. Schuft, now Dr. Waldau, of Berlin, and has been more or less extensively practised in Europe and this country. It consists in making an incision through the cornea, close at its edge, for about one-fifth of its circumference, in drawing out and cutting off the corresponding portion of the iris, in tearing up the anterior segment of the capsule, and in extracting the lens with a delicate scoop. Care is taken not to wound the hyaloid membrane, lest there be an escape of its contents. A good deal of blood sometimes collects in the anterior chamber of the eye, and when this is the case it must be dislodged before the rest of the operation can be proceeded with. If the manipulations are properly executed nearly the whole lens may be removed in one spoonful. Any fragments that may remain are disposed of by the introduction of the scoop, and by gently rubbing the ball through the lids.

In the original operation of Schuft, a bit of the iris was left at the ciliary margin to afford support to the vitreous humor; but it was soon found that the procedure greatly increased the danger of inflammation, without offering any compensating advantage, and it has therefore been abandoned.

The statistics of this mode of extraction are very flattering. Of 60 cases operated upon by Dr. Mooren, 58 were perfectly successful; and in 100 cases in the hands of Dr. Jacobson there were only 2 failures. The operation has also been frequently performed with very satisfactory results at the Royal London Ophthalmic Hospital. A number of successful cases have occurred at Wills' Hospital in this city. The great objection to the operation, it appears to me, is the mutilated appearance which the eye presents after recovery.

After-treatment.—The after-treatment, in all these operations, is conducted upon moderately antiphlogistic principles. The light is carefully excluded from the apartment, the patient's head and shoulders are constantly maintained in an elevated position, the diet is of the mildest character but rather nutritious than otherwise, and the bowels are occasionally relieved by a gentle aperient. If active inflammation arises, blood is taken freely from the arm, and by leeches or cups from the temples, blisters are applied to the inner surface of the arm, and the eyes are frequently fomented with warm chamomile tea containing a few drops of Goulard's extract and wine of opium. If there is much pain, especially of a neuralgic nature, calomel and opium, calomel and Dover's powder, or, what will be found more efficacious than either, wine of colchicum and acetate of morphia, are liberally employed. Depletion after these operations is not carried nearly so far now as formerly. After extraction, in particular, too much caution cannot be used in this respect, inasmuch as too great a drain upon the system might seriously interfere with the union of the corneal wound. When the patient is old or infirm, a nutritious diet and other means calculated to give tone to the system are indispensable to success.

As a general rule, the eye should not be inspected until the end of the third day, and then only in the most cautious manner; for the contact, even of the smallest quantity of light, often proves immensely injurious. The bandage may usually be dispensed with in a week or ten days, a green shade being used as a substitute. The eye must not be employed upon minute objects for several months, and the patient should consider himself for a long time as an invalid, avoiding all indiscretions, both bodily and mental. As the sight improves in strength, and all tenderness consequent upon the operation has disappeared, but not until then, he may begin to wear cataract glasses, of which he should furnish himself with two pairs, with lenses of different degrees of convexity, according as he may wish to view near or distant objects. For reading, a power of two and a half inches' focus generally suffices, whereas one of four inches' focus is required for long range. The best lenses are made of pebble, as it is less liable to be scratched and broken than plate glass. The frame should be very light, and consist of steel. Tinted lenses may be used when the eyes remain long weak, and intolerant of light.

Much of the success which has attended these operations in my hands may, I think, be ascribed to the care which I have always taken in preparing the patient's system, and to the practice which I have pursued, for many years, of administering a full anodyne immediately after he has been put to bed. The article which I usually employ is sulphate of morphia, of which from half a grain to a grain may very properly be given, if the patient is an adult. This seldom fails to prevent pain, and to induce sleep, two circumstances of immense consequence as it respects the favorable issue of the case. If rest is of any importance in the treatment of inflammation, it surely ought to be of the greatest benefit when the disease affects so tender and delicate an organ as the eye; and I know of no means so well calculated to insure this end as a large dose of morphia, given in the way here specified. It is especially valuable in nervous, irritable persons, and in such as are liable to suffer from nausea and severe shock after trifling accidents and operations.

In regard to the relative merits of these operations, we are not in possession of any statistical facts which can aid us in deciding the question. My favorite method, as before intimated, has been, for a long time, the double one of laceration and depression, and such is my confidence in its superiority that I shall continue to practise it until there are more substantial reasons than I now have for abandoning it. It has already been seen that no one procedure is exclusively applicable to all cases, and there can be no question that each, except couching, is capable of affording excellent results in the hands of a judicious surgeon. Destructive inflammation will occasionally follow, no matter how careful we are; no honest man will pretend to uniform success; everything may go on well for a number of days, and the case be, in every respect, most promising, when, all of a sudden, some unfavorable circumstance may arise, and the eye be irretrievably lost. Such a contingency should put us upon our guard, and render us cautious in respect to our prognosis. It is far better, after every operation for cataract, to promise too little than too much. The patient should always be told that he must bide his time.

DISLOCATION OF THE CRYSTALLINE LENS.

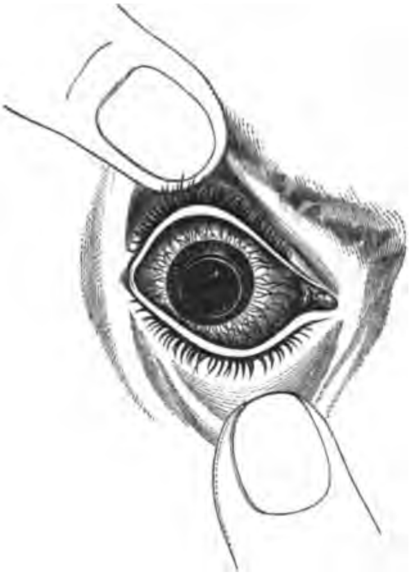
Dislocation of the crystalline lens forwards into the anterior chamber, exhibited in fig. 168, is a rare occurrence. I have met with but two cases of it. It generally comes on spontaneously, or without any assignable cause, although sometimes it is chargeable to external violence, directly or indirectly applied. Blindness, partial or complete, is the necessary consequence of such an accident, and it may easily be conceived how the resulting inflammation might destroy the eye. The following is a brief outline of the cases adverted to.

Catharine Monheimer, a married woman, aged thirty-six, a native of Germany, had been laboring under dislocation of the lens of the eye for three years, when I first saw her, in October, 1849. The accident happened suddenly one night without any pain or even any unpleasant feeling, apparently while she was asleep. The next day, however, she was seized with violent pain and inflammation, which lasted for nearly two months, when it gradually subsided. It is worthy of remark that she had had no sight in that eye for seven years previously. The lens lay in the lower part of the anterior chamber, in close contact with the cornea and iris, and was of a conical shape, the apex looking upwards; it was opaque inferiorly, but semi-transparent above, and was so situated as almost to close the pupil. The cornea was natural, but the iris was tremulous, thrust back, or indented below, and changed in color, being much lighter than the right, which was of a grayish hue. The pupil was small and immovable. The sight was completely destroyed.

The other case was that of a colored woman, aged forty-nine; the right lens, which had been dislocated for four years, without any assignable cause, was of a dirty drab color, and occupied the anterior chamber; it rested against the posterior surface of the cornea, and pressed aside the iris, the pupil being contracted into a narrow slit-like aperture. The eye was completely blind, and had been the seat of neuralgia, off and on, ever since the accident, which was followed by severe inflammation.

The proper remedy for such an occurrence obviously is extraction of the lens, with the employment of active antiphlogistic measures, to moderate and relieve the resulting inflammation. If the case is one of long standing, the operation would still be proper as a means of improving the appearance of the eye, and preventing secondary effects.

Fig. 168.



Dislocation of the lens into the anterior chamber.

DISEASES OF THE RETINA.

The retina, like the other tissues of the eye, is liable to inflammation and its various consequences, particularly effusions of fibrin, serum, and blood, leading to disorganization of its structure and to loss of function. The disease, at one time, is acute and characteristic, being marked by symptoms which no one can possibly mistake; at another, slow, chronic, and so obscure as to elude the closest scrutiny; now transient and easily combated; now inconceivably obstinate, and hopelessly irremediable. Considering the delicate structure of the retina, its concealed situation, the importance of its functions, and the extent and character of its connections, it is not surprising that the nature of its diseases should have been so long misapprehended, misinterpreted, and misunderstood. As these lesions are never fatal, few chances have been afforded of inspecting the eye after death, and, therefore, much of what has been written about the pathology of this membrane is based upon conjecture rather than upon the results of actual observation. Now, however, that the ophthalmoscope has been introduced, we may hope soon to be able to elicit important information in regard to the nature and diagnosis of these affections, and, consequently, also respecting their treatment; already light is gleaming in the distance, and the combined researches of scientific surgeons in different parts of the world cannot fail to lead to useful revelations. If the instrument do no more than teach us the utterly hopeless nature of certain maladies, and the folly of treating them with harsh, injurious remedies, it will confer incalculable benefit; but it will, doubtless, do more; by enabling us to make out an early diagnosis in cases hitherto found impossible of recognition, it will lead to the establishment of a more rational pathology and practice.

The only affections of the retina which will require notice in a work of this kind are acute and chronic inflammation.

1. *Acute retinitis* is rare as a pure, uncomplicated disease, but as a secondary affection it is by no means uncommon. There are few cases of violent sclerotitis, iritis, and corneitis in which the retina does not participate, to a greater or less extent, during the progress of the morbid action. The causes of the complaint

are not always obvious. It is usually said to be owing to exposure of the eye to intense light, as in looking at the sun, or at the fire of a furnace; to excessive and long-continued fatigue of the organ; and to various kinds of external injury, especially such as involve the iris and ciliary ligament In general, only one eye is affected at the beginning, but as the disease progresses the other may also be invaded, the probability of this being so much the greater if the inflammation is very intense and protracted. Acute retinitis is sometimes observed in lying-in females, within the first ten days after parturition. I have seen several cases of this kind, in each of which the attack seemed to be associated with, or dependent upon, a rheumatic state of the system. Very young subjects rarely suffer from this disease, except as a secondary affection. Finally, the inflammation may invade a part of the retina, or the whole membrane.

The most prominent *symptoms* of acute retinitis are, violent pain, excessive intolerance of light, profuse lachrymation, scintillations, and various kinds of spectres, with rapid failure of sight, generally eventuating in total blindness. The pain, perhaps intermittent at the commencement, soon becomes intense and distracting; it is deep-seated, darts about in different directions, and is often attended with intolerable hemicrania. The patient is annoyed by flashes of light, sparks, or luminous bodies, and by an endless variety of the most grotesque objects, which float before his eyes and disturb his imagination. The affected organ feels full and tense, as if it would burst, and the slightest motion or pressure is attended by an increase of the local distress. Photophobia and lachrymation are usually present in a marked degree, beginning early, and lasting throughout the attack. In the more violent and rapid forms of retinitis there is often total extinguishment of vision in a few hours, before there is any apparent involvement of the other structures of the eye.

The pupil, in acute retinitis, is, at first, slightly contracted, sluggish, and irregular; by and by, however, it becomes dilated, and ultimately, when the disease is fully established, it is expanded to the very utmost, and totally insensible to light. A vascular zone is often perceptible at the anterior part of the sclerotica, but it is much more faint than in iritis and corneitis, and is, therefore, of great diagnostic value. When the malady continues for any length of time, the other tunics of the eye participate in the inflammation; the iris is changed in its color, the cornea is rendered hazy, and the conjunctiva and sclerotica are red and deeply injected. Suppuration of the eye is a rare occurrence.

There is no disease with which acute retinitis can possibly be confounded. The distracting and intolerable pain, the flashes of light, the spectral illusions, the absence of the ordinary phenomena of disease in the other tissues of the eye, the motionless and dilated state of the pupil, and the rapid diminution of sight, with its ultimate complete extinguishment, are unmistakable evidences of the nature of the complaint.

The *prognosis* is most unfavorable. Even in the milder cases, complete recovery is seldom to be looked for, while, in the more violent, total blindness may be considered as inevitable. Under such circumstances, the retina is apparently completely overwhelmed by the disease, its substance being irretrievably disorganized by the inflammatory action. We cannot speak positively of the morbid deposits in this disease, but we may suppose that they consist of serum, fibrin, and blood, either alone, or variously combined.

The *treatment* of acute retinitis must obviously be of the most vigorous character; for, it need hardly be added, after what has been said respecting the rapid and destructive march of the disease, that, even if only a few hours are lost in indecision, the sight may be hopelessly destroyed. Copious venesection, leeches to the temples, active purgation, and the use of antimonials and opiates, with rapid ptyalism, are the remedies mostly to be relied upon. Unfortunately, the sight is often completely annihilated before we are able to see the case, the patient, in fancied security, supposing that the inflammation will soon subside of its own accord, when, in fact, it has probably already done its worst.

2. *Chronic retinitis* may be a sequel of an acute attack, or it may exist as an original and independent affection, coming on in a gradual and stealthy manner,

slowly, but surely, undermining structure and function. Among the more common causes of the disease are, over-exertion of the eye, long-continued exposure to vivid light, external injury, and neuralgia of the ophthalmic branches of the fifth pair of nerves. Excessive indulgence in eating and drinking, abuse of sexual intercourse, and suppression of habitual discharges, are also capable of producing the affection. A gouty and rheumatic state of the system has been known to predispose to an attack of this kind. Several years ago, a gentleman was under my care on account of chronic retinitis, contracted while travelling in a railroad car, during a long journey; he had formerly been a martyr to rheumatism, and had just suffered from a slight attack of his old complaint, when his eye became affected. The symptoms of retinitis had existed, in a gradually gravescent form, for nearly two months, when, almost suddenly, they disappeared upon a recurrence of severe inflammation in the right knee. One of the most common causes of this disease, according to my experience, is circumorbital neuralgia. In the southwest, chronic retinitis, from this affection, is by no means infrequent. During my residence at Louisville, a period of sixteen years, I met with many cases which clearly owed their origin to this circumstance alone. The operation for cataract by depression is often followed by chronic retinitis.

The *symptoms* of the disease are generally strikingly characteristic. The patient complains of deep-seated pain in the eye, with neuralgia in the forehead, face, and temple; he is annoyed with sparks, scintillations, or luminous bodies, and his sight progressively diminishes, growing daily more and more dim, so that at length he can, perhaps, barely distinguish light from darkness. In general, he can see objects better in bright than in cloudy weather, and at noonday than in twilight, especially when his back is turned towards the sun. Various fantastic objects usually float before his eye; everything looks as if it were veiled in a mist, haze, or spray; now an insect, as a fly, gnat, or spider, is in the way; now a shower of dust, or particles of dirt; now a thick cloud; now the bough of a tree, a cobweb, a gauze, or an appearance of shooting stars. If, before the sight is much impaired, the patient attempts to read, the letters will be found to look as if they were fused together, turned upside down, or unnaturally short or long; his eyes become immediately fatigued and painful, and, for some hours afterwards, his vision will be proportionately more dim. The pupil, at first merely a little sluggish and somewhat dilated, gradually loses all sensibility to light, and expands to the very utmost, forming merely a black, narrow ring behind the cornea; besides, it is more or less irregular in its shape, the most common deviations being the oval and angular. The interior of the eye looks dead and lustreless, with a greenish or slightly yellowish appearance at the bottom; and the countenance has a peculiarly vacant stare, almost characteristic of the nature of the disease. In the more advanced stages of the complaint, the vessels of the conjunctiva are preternaturally numerous, large, and almost varicose.

Of the *pathology* of this disease nothing definite is known. Generally beginning at a comparatively small point of the retina, the morbid action gradually spreads in different directions, until, at length, it involves its entire substance, from one extremity to the other. The most common alterations are, softening, deposits of fibrin and blood, and effusions of serum, with a varicose condition of the vessels of the retina and choroid.

A separation of the retina is by no means infrequent. In general, it presents itself as a bluish or grayish bag, of a globular or ovoidal shape, filled with water, and projecting into the vitreous humor, which is itself always more or less softened and changed in color. This accumulation of serum, which constitutes what is sometimes called *dropsy* of the retina, may occur in any part of the globe, but in the great majority of cases it will be found at its inferior half, especially when the examination is made after the morbid action is a good deal advanced.

The *prognosis* in chronic retinitis is unfavorable. If the patient is seen early in the attack, a complete cure may occasionally be effected, although such an event is to be regarded rather as the exception than as the rule. In general, the nature of the complaint is entirely overlooked, both by the patient and the practitioner, and the consequence is that the only time when treatment is likely to be of benefit is allowed to pass by in the delusive hope of spontaneous relief. What renders the prognosis worse in this disease is that the morbid action nearly always involves the deeper structures of the eye.

The *treatment* of chronic retinitis must be conducted upon general principles, especially a consideration of the nature of the exciting cause, the stage of the complaint, and the condition of the patient's system. There is no question that, until very recently, this disease was usually most sadly mismanaged; for, under the vague name of "amaurosis," by which it was generally known by practitioners, all kinds of remedies, of the most opposite and absurd nature, used to be resorted to, with no other result, commonly, than that of aggravating the local mischief and inflicting serious injury upon the sight. It was almost the universal custom to bleed, purge, salivate, and starve such patients, often reducing them literally to death's door, by the consequent exhaustion. Such a course was well calculated to ruin both the eye and system. Now, that the mischievous effects of this practice have been fully exposed, there is not a little danger of carrying the error into the opposite extreme. We are too much disposed, at the present day, to cram and stimulate.

Anything like general bleeding and active purgation is only to be thought of in the event of decided plethora and great local congestion. Ordinarily, all the blood that ought to be removed can be advantageously taken by leeches, or the use of a cup to each temple. The bowels should undoubtedly be kept quite free, and the best remedy for the attainment of this end is blue mass, in union with compound extract of colocynth, or a few grains of calomel, rhubarb and aloes. The diet should be plain and simple, but rather nutritious than otherwise, particularly if there is evidence of debility, in which case it may also be necessary to exhibit some tonic, as iron and quinine. The great remedy, however, in chronic retinitis, is mercury, given in small doses, twice in the twenty-four hours, for several weeks, or even months, with a view to its general alterative action. The effects of the medicine are carefully watched; for anything even like an approach to salivation must be avoided. The mercury is administered, not for the purpose of making a direct impression upon the eye, but in the hope merely of ameliorating its condition, by improving the general health. Counter-irritation by blister or issue should receive early attention; the feet should be immersed every night for thirty minutes in hot mustard water; the eye should be maintained in a state of the most profound quietude; a green shade should be worn to exclude the light; and gentle exercise should be taken daily in the open air. When there is much pain in the branches of the ophthalmic nerve, a large blister to the forehead often produces a most salutary effect. In such cases, too, strychnia will be useful, either alone, or in union with arsenious acid and aconite, it being understood that these articles are given in very minute doses, and only with a view to their general action.

Any tendency to relapse, which is always very great in this disease, must be counteracted by perfect quietude of the eye for a long time after all morbid action has apparently vanished, and by special attention to the state of the general health. Moderate exercise, a pure air, and the use of the cool or tepid shower-bath, will go far in securing this result. A sea voyage sometimes proves eminently useful.

3. *Amaurosis*, a term much employed by ophthalmic writers, literally signifies obscure vision, from whatever cause arising, but, at the present day, it is restricted to dimness of sight, produced by disease of the retina. This lesion of the retina may be purely functional, and, therefore, temporary; or it may be organic, in the worst sense of the word, and, therefore, more or less permanent. Again, amaurosis may be partial, or complete; in the one case, the patient is still able to perceive light, and perhaps discern objects with some degree of satisfaction; in the other, he is totally blind, the retina being perfectly insensible to the strongest light, however concentrated. It will thus be seen that the term amaurosis is used simply to denote the existence of a particular symptom, and

not the pathology of the disease; a distinction of much practical consequence, and one which, unfortunately, is too often lost sight of by the practitioner.

Amaurosis may arise from a thousand *causes*, many of them of the most opposite and diversified character. A mere catalogue of these causes would form a large chapter. At one time it is purely inflammatory, at another wholly asthenic; in one case it is induced by plethora, in another by anemia; now it is purely functional, depending upon disease in other parts of the body, now entirely organic, occasioned by the most serious structural lesion. Another circumstance, hardly less interesting in a practical sense, is that amaurosis sometimes comes on in an instant, literally in the twinkling of an eye, as when the organ is suddenly exposed to an intense light. Thus, persons have sometimes been struck down blind in gazing at the sun during an eclipse, or in looking at a bird soaring through the air. Microscopists, artists, and other persons whose avocation demands great minuteness of sight, occasionally suffer in a similar manner. A flash of lightning has more than once produced irremediable amaurosis. Worms in the alimentary canal, the repulsion of cutaneous eruptions, the suppression of habitual discharges, derangement of the stomach, congestion of the brain, neuralgia of the fifth pair of nerves, inordinate sexual indulgence, the excessive use of quinine, profuse chewing, exhausting courses of mercury, and over-exertion of the eye, may all be enumerated as so many exciting causes of the disease. I recollect a case in which amaurosis was instantly produced by the ferule of an umbrella thrust into the orbit in such a manner as to compress the ball forcibly against its bony walls. In two other examples, the disease was the result of a slightly contused and lacerated wound of the eyebrow, apparently implicating the supra-orbital nerve. Compression of the brain, also, whether produced by effused blood, depressed bone, or some morbid growth, often leads to amaurosis; similar effects occasionally follow concussion of this organ, though they are usually of a transient nature.

Cases are sometimes met with in which amaurosis observes an intermittent course, the loss of sight recurring once every twenty-four hours, very much like an attack of intermittent fever.

The *symptoms* of amaurosis are such as characterize chronic retinitis, and, therefore, need not be described here. A dilated, motionless, and insensible state of the pupil, a peculiar lustreless expression of the eye, total blindness, and a congested and enlarged state of the vessels of the conjunctiva, with a singularly vacant stare of the countenance, are signs which can never be mistaken.

It is obviously impossible to lay down any definite rules of *treatment* for a lesion whose causes are so numerous and diversified as those of amaurosis. The intelligent and conscientious practitioner will not fail to make the disease, in every case that may come under his observation, an object of special study and inquiry; often, indeed, his remedies must be addressed empirically, for, like the benighted navigator, he will frequently find himself, so to speak, without rudder and compass. Cases, however, constantly occur where the causes of the disease are so apparent as to render it impossible to mistake them, and it is to this class that he should especially direct his skill and attention, since experience has shown that many of them are perfectly susceptible of cure. The old, and, perhaps, not yet entirely exploded practice of bleeding, purging, and salivating every patient affected with amaurosis, without any proper regard to the nature of the exciting cause, cannot be too severely censured. It affords a melancholy illustration of the folly of prescribing for the name of a disease instead of the disease itself. Undoubtedly plethora should be removed as well as debility, but this can usually be done by milder and more effective means, less likely to ruin the part and system. When the retina is totally disorganized, any treatment, however mild, must be wholly out of the question, except in so far as it may tend to improve the general health, and thus prevent a similar misfortune to the other eye, supposing that one alone is originally affected. One important use of the ophthalmoscope is to throw light upon this class of cases, and to afford information for a more rational plan of treatment.

DISEASES OF THE CHOROID.

The diseases of the choroid were, until a comparatively recent period, denied a place in the nosological tables of the internal ophthalmiæ; and there are many practitioners who still question the propriety of such a position. Their reason for this opinion would seem, at first sight, to be well founded; but its fallacy becomes at once apparent when we reflect upon the structure of the choroid, its extraordinary nervous and vascular endowments, and its intricate relations with the retina, iris, and sclerotica. Its concealed position doubtless often protects it from morbid action, to which some of the other tunics, which are more exposed, are so obnoxious. The fact is it is the difficulty of distinguishing these diseases that has kept them so long in the background, and has caused the scepticism here alluded to. It has only been by the most careful and patient study that we are at length enabled to diagnosticate them with any degree of satisfaction. That their more delicate shades often escape observation, even now when they are so much better understood than formerly, is unquestionable, and this circumstance should admonish us to push our researches still further into their history and character.

The only lesion of the choroid requiring special notice is *inflammation*. That this is rare, as an independent malady, the united testimony of ophthalmological writers abundantly attests; while, as a secondary disease, it is probably quite frequent, often existing as a complication of iritis, retinitis, and sclerotitis. It occurs at all periods of life, but is most common in young and middle-aged persons, particularly in those whose avocation compels constant and intense application of the eyes to the purposes of minute vision. It has been asserted by Mr. Tyrrell that, soon after the death of the Princess Charlotte of Wales, when the whole English nation went into mourning, an immense number of cases of choroiditis occurred among the dress-makers of the British metropolis, on account of the severe labor imposed upon them by the mercenary conduct of those who had the control of their time and service. Many of these poor creatures, ill-fed, overworked, and deprived of proper air, suffered from disturbance or loss of vision from this disease, brought on by excessive and long-continued concentration of the eyes upon the black material used as the conventional garb of grief. The inflammation, in many of the cases, began in the choroid; in some it took its rise in the iris, retina, or sclerotica; while in a third series of cases it apparently commenced simultaneously in all, or, at least, in several, of these structures. Be this as it may, it is very certain that when the choroid is at all seriously inflamed the other tunics of the eye are extremely liable to become inflamed also; whether the converse of the proposition is true, in an equal degree, the present state of our knowledge hardly permits us to state. Congestion and subacute inflammation of the choroid are probably the cause of the morbid sensibility of the eye so common in young men at college, and in literary persons incessantly devoted to reading and writing. Strumous subjects, and persons who have become enfeebled by ill health, privation, protracted lactation, and loss of blood, are most liable to suffer.

The *symptoms* of acute choroiditis resemble somewhat those of retinitis, only that there is, in general, much less perception of luminous matter. The pain is deep-seated, dull, heavy, and throbbing, shooting about in different directions, especially towards the base of the brain, where it is often exceedingly severe. The eye is tender on pressure; there is a sense of tension or fulness; and every movement of the ball is attended with an aggravation of suffering. There is commonly severe pain, of an intermittent character, around the orbit and in the temple, and the patient is harassed with intense cephalalgia, and a feeling of weight and tightness in the forehead. The sight soon grows dim, and often disappears completely within a few days from the commencement of the attack. Various fantastic objects float before the eye; at first, as little moats or specks, of a grayish, yellowish, or darkish appearance, and afterwards, as the disease augments in violence, as a thick mist, gauze, or veil. The ball of the eye is of a dull, reddish, pink, or brick-dust color, and there is generally a faint zone around the cornea, from which the vessels extend backwards over the surface of the sclerotica in fine radiating lines. The conjunctiva itself is seldom much injected. The iris is dull and discolored, and the pupil, contracted and irregular, soon becomes motionless, and adherent to the capsule of the lens, which, together with the lens itself, is frequently rendered opaque, either by plastic deposits, or by disease of their proper substance. Gradually the retina and vitreous humor are assailed, the latter being dissolved and broken down, and the globe, in consequence, converted into a soft, flaccid, fluctuating mass. The sclerotica, also becoming implicated, gives way at some particular point, usually towards the cornea, forming a protrusion, of a bluish color, known by the name of staphyloma.

The *diagnosis* of choroiditis merits special attention. The disease with which it is most liable to be confounded is iritis, from which, however, it may, in general, be pretty easily distinguished by a careful examination of the eye, and a proper inquiry into the history of the attack. In choroiditis, disturbance of vision is an early and prominent symptom, and always precedes any alteration in the iris; moreover, the loss of brilliancy and the alteration of color of this membrane are always less conspicuous than in the latter disease, and the vascular zone around the cornea is also more faint and dull. In iritis, the sight is often comparatively little affected for some days, although the structure implicated usually undergoes very striking changes within a very short time after the establishment of the disease. Furthermore, in primitive iritis there is always a greater amount of plastic deposit in the anterior chamber, more irregularity of the pupil, and a more distinctly defined vascular zone around the cornea. When the two maladies have made considerable progress, the symptoms and appearances are generally so much alike as to defy all attempts at accuracy of diagnosis. In such an event, the only guides are the history of the case and a careful ophthalmoscopic inspection.

The *prognosis* of choroiditis is unfavorable. When the disease has made much progress before we have an opportunity of interposing our remedial measures, the chances are that the sight is already destroyed, or, at all events, so much impaired as to render its restoration impossible. Hence, the importance of an early diagnosis, and of an efficient treatment.

The *treatment* of acute choroiditis must, in the main, be conducted upon antiphlogistic principles, with a proper regard, however, in every instance, to the state of the constitution, the violence of the attack, and the age of the patient. A plethoric condition of the system will demand bloodletting, copiously, and, perhaps, repeatedly, with leeching or cupping of the temple, active purgation, and the use of mercury, carried to rapid ptyalism. Reduction of the inflammation must be attempted at all hazards, and in the shortest possible time; a few days, or even twenty-four hours, passed in temporizing, may lead to hopeless blindness. The treatment is, of course, less active when the patient is feeble from previous disease or present suffering, or when the inflammation has already produced serious structural lesion; here our chief reliance is upon local depletion, counter-irritation by blisters to the forehead, temple, or nape of the neck, correction of the secretions, mild aperients, and the gentle operation of mercury, with nutritious food and drink. When the disease has assumed a decidedly chronic form, a change of air, sea-bathing, and tonics, particularly iron and quinine, will aid in rebuilding the constitution, and contributing to the maintenance of what little vision may be left.

GLAUCOMA.

The term glaucoma was originally employed to designate a greenish opaque appearance, occasionally seen in the bottom of the eye, and generally dependent upon a change of color of the lens, as yellowish, amber, yellowish-red, or reddish-brown. At present, however, it is used in a mere arbitrary sense, to denote a peculiar form of blindness, attended with various morbid changes of all the structures of this organ.

The disease, which may be either acute or chronic, is obviously of an inflammatory character, as is evinced by the nature of its symptoms, by ophthalmoscopic inspection, and by the results of dissection. The humors are opaque and increased in quantity; the retina and choroid are covered with plastic matter, highly vascular, atrophied, softened, and disintegrated; blood is effused either in a pure state, or intermixed with lymph; capillary apoplexy of the retina is common; the optic disc is greatly reduced in size, as well as remarkably excavated, especially in chronic cases; and all the tunics of the eye, both internal and external, are profoundly congested, many of the vessels exhibiting a tortuous, varicose appearance.

Thus, it is evident that glaucoma, in the sense in which the term is now used, is not an irido-choroiditis, as some have alleged, but especially an ophthalmitis, involving all the structures of the eye, the humors as well as the tunics. Of its point of departure we are completely ignorant.

Uncommon before middle life, it is most frequent from the fiftieth to the sixtieth year, usually affects both eyes, though seldom in an equal degree, at least not at first, and is generally preceded by a prodroma, or state of incubation, the transition from which to the acute stage is sharp and sudden in acute, insensible and gradual in chronic, glaucoma. The subjects of the disease are for the most part presbyopic, weakly, thin, and more or less anemic from previous suffering.

Among the earlier *symptoms* of glaucoma is a gradual impairment of vision; the patient finds that he is becoming nearsighted, and that objects appear more dim than formerly, looking as if seen through a mist. The eyes are soon fatigued by any unusual exertion, as prolonged reading or writing; occasional flashes of light occur, and a halo is perceived around the flame of a candle. After a while vague pains are experienced in the eye, brow, and temple, the pupil is enlarged and sluggish, the cornea is flattened, the anterior chamber is diminished, and the eye feels abnormally tense on pressure.

Acute glaucoma is generally characterized by great violence. The pain, which is often neuralgic, and ocular as well as circumorbital, is either sharp and darting, or dull, heavy, and aching; colored spectra dance before the eye, or flashes of light are perceived; objects appear misty, as if surrounded by smoke; the field of vision is contracted, and total blindness sometimes occurs in a few hours. The subconjunctival tissues are congested and œdematous; the cornea is dull and almost insensible; the anterior chamber is hazy and abnormally small; the pupil is widely dilated, irregular, oval, and motionless; and the iris, deprived of its fibrous appearance, is of a dirty, grayish or slaty tint, and pushed forwards by the lens, which is opaque, faintly striated, and swollen, as if macerated. The globe, which is almost of a stony hardness, is exquisitely tender, and feels as if it would burst. Sometimes the veins of the iris are so much enlarged as to be visible to the naked eye. Well marked fever, nausea, loss of sleep, cephalalgia, and great mental depression usually attend the attack. Ophthalmoscopic inspection is impracticable by reason of the opaque condition of the cornea and of the humors.

In chronic glaucoma, which may last for months and even years, the patient being alternately better and worse, the attack generally begins insidiously. The sight gradually grows dim, the eye loses its brilliancy, and dull, aching pain is occasionally felt in and around the orbit. Bright flashes, coruscations, or colored spectra are perceived, at first at long intervals, but afterwards almost constantly, and usually constitute a source of real suffering. The subconjunctival vessels are purple and varicose, and a faint vascular zone is observable upon the sclerotica, in the ciliary region. The cornea, losing its convexity and sensibility, is dull and finely granulated or even slightly vesicated; the iris is lustreless and traversed by enlarged veins; the pupil is dilated, irregular, fixed, grayish or grayish green, and occasionally partially adherent to the lens; the humors are cloudy; the anterior chamber is almost obliterated; the eye is uncommonly hard; and vision is either extinct, or reduced to the merest perception of light. The general health is usually considerably impaired, but there is seldom any fever, unless the disease suddenly passes into the acute form. Ophthalmoscopic inspection, possible in nearly all cases, reveals a well-defined and cupped appearance of the optic nerve, with engorgement of the retinal veins, ecchymoses, and pulsation of the arteries at the fundus.

In the *treatment* of acute glaucoma ordinary antiphlogistic remedies, however vigorously pushed, are of little, if any, benefit. General bleeding and active mercurialization are not only useless, but positively injurious. Unless prompt relief is afforded, blindness, total and irretrievable, must inevitably result from the rapid changes experienced by the retina from the pressure of inflammatory products, the enlarged and congested condition of the vessels, and the excessive intra-ocular pressure. Paracentesis of the eye, by taking off some of this pressure, may afford transient amelioration, but complete relief can only be obtained by iridectomy, devised by Graefe in 1856, and now almost universally relied upon as the sheet-anchor of our hope in the treatment of this affection. The operation, which consists in the removal of a section of the iris, should be performed early and effectually. Every hour is precious when there is great intensity of action. It affords relief upon the same principle as an incision in external inflammation, by the removal of the excessive tension of the globe, and the drainage of the irido-choroidal and retinal vessels, at the same time that it places the absorbents in a better condition for exerting their peculiar influence upon the inflammatory deposits. Iridectomy should be performed, in acute cases, even if there is complete loss of sensibility of the retina. The sight may not, it is true, be restored by it, perhaps not even materially improved, but the agonizing suffering and inflammation will be sure to be speedily arrested. In chronic glaucoma, where there has been total blindness for some time, no improvement of vision is to be expected, and the operation is performed solely to relieve pain and tension.

The patient, during the performance of iridectomy, should be recumbent, and thoroughly chloroformized. The lids are separated by a wire speculum. The eye, steadied with a pair of forceps, is penetrated with an ordinary cataract knife, through the cornea, close to the sclerotica, and immediately in front of the pillars of the iris, the opening being about one-third of an inch in length. The protruding iris is then grasped with the forceps, drawn out, and cut off to the extent of about one-sixth of the entire membrane, as far as its periphery. The gap, if made above, will be measurably concealed by the superior lid. Care must be taken not to injure the lens.

The after-treatment is conducted upon the same general principles as in the operation for cataract and artificial pupil. The excessive pain and tension rapidly decrease, and a marked abatement also ensues in the inflammation.

STRUMOUS DISEASES.

Strumous ophthalmia exists in various forms and degrees; sometimes as a very mild affection, at other times, as a most severe one. It may be acute or chronic, and attack both eyes, or be limited to one. It generally simultaneously involves a number of structures, especially the conjunctiva, cornea, iris, and retina.

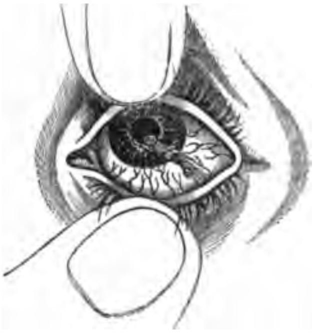
The prominent *symptoms* are intolerance of light, excessive lachrymation, and violent pain. The photophobia is usually very distressing. The smallest ray of light is frequently productive of the keenest suffering, and the patient consequently uses every possible precaution to prevent its intrusion. For this purpose he generally, if he is a child, as is commonly the case, creeps into the darkest corner of his chamber, where he covers his eyes with his hands, or buries his head in a pillow, or, perhaps, in his mother's lap. In this condition he often remains for hours, afraid to change his posture, lest the light should meet his eyes, and so increase his distress. Children thus affected frequently experience an aggravation of all their suffering, even from the light of the moon and of the stars, such is the excessive sensibility of the retina.

Lachrymation is commonly a prominent symptom. Exposure to light and cold always increases it. The tears are usually hot and scalding, and their discharge is always attended with temporary relief. Sometimes they are so acrid as to irritate and inflame the cheeks. The quantity of fluid that is thus evacuated in the twenty-four hours may amount to several drachms.

It is rare, in strumous ophthalmia, to witness a copious discharge of *mucus*, or of muco-purulent fluid. Even when there are excessive photophobia and great lachrymation, there is seldom much secretion of this description; often, indeed, not enough to agglutinate the edges of the lids. In this respect, scrofulous inflammation forms a striking contrast with some of the other varieties of ophthalmia, in which an immense quantity of mucus, or of mucus and pus, is discharged during the height of the morbid action, and even during its decline.

There is usually very little *redness* of the conjunctiva in this variety of ophthalmia. In ordinary inflammation, discoloration of this membrane is a constant occurrence, and so conspicuous as generally at once to attract attention. In strumous inflammation, the vessels observe a straggling arrangement; they are seldom very turgid, and they extend from the circumference of the ball inwards towards the cornea, where they are often congregated into little groups, or clusters, beautifully interlacing with each other, as in fig. 169. When the disease is violent, or of long standing, the vessels occasionally pass over the cornea, either singly or in parallel lines, separated by narrow intervals. In ordinary ophthalmia the vessels are extremely numerous, and generally arranged in the form of a confused network. In a word, there are hundreds, where there is one in strumous ophthalmia.

Fig. 169.



Scrofulous ophthalmia with phlyctenulæ on the cornea and a fasciculus of vessels running into it.

Another important symptom is the existence of little minute *vesicles* at the margin of the cornea, occurring either separately or in groups, and varying in size from the smallest perceptible speck to that of an ordinary pin-head. They each contain a minute quantity of serum, and are frequently encircled by a delicate plexus of vessels. Their shape is globular, ovoidal, or angular. Sometimes they exist partly on the sclerotica and partly on the cornea. As they are witnessed in no other form of ophthalmia, they are of great value as a diagnostic sign.

Strumous ophthalmia seldom continues long without giving rise to *opacity* of the cornea, presenting itself in different degrees, from the slightest haziness of the part to complete loss of transparency. In the latter case, it is always to be greatly dreaded, as it is generally followed by total blindness and irremediable disfigurement of the eye.

Ulceration of the cornea is another frequent effect of this variety of ophthalmia. It often begins at an early stage of the disease, and may proceed with more or less rapidity until it extends through the entire thickness of the membrane. The most common form of the ulcer is that of a dimple-shaped depression, with smooth and rather sharp edges, the surface looking as if a piece had been scooped out of it. Generally, the ulcer has a hazy appearance, but not unfrequently it does not differ in its color from that of the adjacent parts, and hence, unless the cornea is examined with great care, while the light is falling upon it at a particular angle, the disease may readily escape detection. Sometimes several such erosions exist upon the eye, forming either simultaneously, or in pretty rapid succession. If permitted to progress, they occasionally extend through the different layers of the cornea, as far as the anterior chamber of the eye, the humor of which may perhaps escape through the abnormal opening, or, what is more common, the opening is closed up by the membrane of the aqueous humor, or even by the iris itself.

The *pain* attendant upon strumous ophthalmia is sometimes intense, while at other times it is very insignificant, if not wholly absent. In confirmed cases, it is always aggravated by the slightest exposure of the affected organ to the light, by medicated applications, by disorder of the bowels, by indulgence in eating, by rough contact, and by various other circumstances unnecessary to be mentioned. Occasionally it is situated deeply in the ball of the eye, in the orbit, or at the base of the anterior lobes of the brain; sometimes it affects merely the lids and brows; occasionally it is most severe in the temple, forehead, or cheek. It may be sharp, shooting, or darting; dull, heavy, or aching; throbbing, or pulsatile; continued, or intermittent. Not unfrequently it assumes a neuralgic character, recurring periodically, like neuralgic pain in other parts of the body. Whatever may be its nature, it is often so severe as to deprive the patient of sleep and appetite, and, indeed, of all comfort, for days and weeks together.

Strumous ophthalmia is rarely attended with any *tumefaction* of the lids. On the contrary, these structures usually retain their normal shape and size; in consequence, however, of the excessive intolerance of light, they often present a remarkably drooping appearance, owing to the manner in which they are drawn over the eyes. When the disease is very protracted, the edges of the lids frequently become inverted, so that the cilia impinge constantly against the cornea, thereby inducing opacity of this membrane, great increase of pain, and additional inflammation. Although, in general, there is an absence of swelling of the lids, this symptom occasionally exists in a very marked degree. This is especially apt to happen in young children of a leucophlegmatic habit, with a thick upper lip, a tumid belly, and a soft, flabby tongue, along with great derangement of the digestive apparatus. The whole system, in such cases, seems to be surcharged with strumous disease, which, in consequence, it is extremely difficult to dislodge from the eyes, which frequently become its victims.

In many cases little vesicles, not larger than the head of a small pin, and filled with serum, occur on the cheeks, the inferior lids, round the nose, or on the lips. Of a whitish, almost pearly aspect, they are usually discreet, though often closely grouped together, rest upon a slightly reddish base, are most common in children of a deeply-marked strumous habit, and seldom come on until after the inflammation has made considerable progress. Their presence almost invariably denotes great obstinacy in the morbid action, and proportionate difficulty in effecting a prompt and permanent cure.

The *diagnosis* of this affection is usually sufficiently easy. The excessive intolerance of light, the unwonted lachrymation, the absence of redness in the conjunctiva, together with the peculiar straggling arrangement of its vessels, the phlyctenular and opaque condition of the cornea, the want of tumefaction, and the manner in which the lids are drawn over the ball of the eye, are signs which, once observed, can never be mistaken. Add to these phenomena the fact that the disease usually arises insidiously and without any assignable cause; the strumous appearance of the features; the coldness of the extremities; the tumid condition of the belly; the formation of vesicles on the face, and various other evidences of the strumous diathesis, and all doubt respecting the true nature of the case must instantly vanish. Indeed, no practitioner, unless he is culpably ignorant of ophthalmic diseases, can possibly commit an error of this kind.

The *prognosis*, in this disease, must necessarily be influenced by various circumstances, as, for example, the progress and extent of the morbid action, the state of the patient's health, and the nature of our remedies. In the milder forms, in the earlier stages of the malady, and under proper management, recovery of the affected organ may generally be reasonably predicted. But, under opposite circumstances, the worst consequences may, not unfrequently, be looked for. Ulceration of the cornea often extends, despite our remedies, to a great depth, and sometimes even to complete perforation; an event which is sure to be followed by permanent impairment, if not total loss, of sight. Superficial opacity, even when it is diffused over the greater portion of the cornea, is generally readily amenable to treatment, but when it involves several of the layers of the membrane, or when a considerable period has elapsed since its formation, or, in other words, when time has been permitted for the organization of the lymph, upon the presence of which the opacity depends, then the case will necessarily be unpromising, both as it respects the future appearance of the eye and the amount of vision. It is fortunate that strumous inflammation of this organ rarely terminates in gangrene of any of its structures. Such an event, judging from my own observation, is extremely infrequent.

Of the exciting *causes* of this disorder very little is known with any degree of certainty. Its origin is often ascribed to circumstances which have no agency whatever in its production. Sometimes it is directly traceable to external injury, as a blow, or a wound; in many cases it is apparently brought on by long exposure of the eye to a strong light, or by excessive fatigue of the organ, induced by reading, writing, or sewing. Suppression of the cutaneous perspiration is probably another, if not a frequent, cause of the disease. In young girls, I have occasionally seen it connected with irregularity of the menses, but whether as a cause or an effect could not always be determined. Perhaps the most common cause of all is derangement of the digestive apparatus. Whenever the predisposition exists, as it always does in this affection, almost anything, however trivial, may bring on an attack.

The disease may be limited to one eye, or it may occur in both, either simultaneously or successively. In nearly every instance, there is serious involvement of the conjunctiva and cornea, if not also of the sclerotica and iris. The retina also is either inflamed or morbidly sensitive, as is evinced by the excessive intolerance of light which so invariably attends the malady.

The *age* at which this disease occurs is an important circumstance in its history. It is extremely rare for it to begin after the period of puberty, and in no instance have I witnessed its outbreak in middle or advanced life. It is emphatically a malady of infancy and early childhood. According to my observation, it rarely shows itself before the age of eighteen months, or two years. It occurs in both sexes, and in every rank and condition of life, but more frequently among the poor, ill-fed, and ill-clothed, than among the refined and wealthy. The offspring of the consumptive, and of those who have suffered from tubercular disease of the spine, hip, arachnoid membrane, and lymphatic ganglions, are most liable to it.

Treatment.—The great remedy in the treatment of this disease is quinine, either alone or in union with other means. I am very certain, from long experience, that it deserves to be placed at the head of all other articles in this variety of scrofulous affections. To produce its full effects, however, it must be administered with due regard to the patient's system. Injudiciously given, it may not only prove useless, but positively hurtful. There are, according to my experience, two distinct classes of strumous disease of the eye. In the one, the patient is pale and thin, with a languid circulation, and cold extremities; in the other, he is stout and robust, the cutaneous circulation being active, and the hands and feet habitually warm. Other points of dissimilarity readily suggest themselves, but these it is unnecessary to point out, as the distinction which I wish to establish must be sufficiently apparent. Now, to treat such cases alike would be a palpable absurdity. It is only by properly discriminating between them that we can expect to arrive at a satisfactory result, as it respects the employment of this important therapeutic agent. Hence, one practitioner will often mismanage a case, which another, having more judgment and more experience, will promptly cure, the disease, perhaps, disappearing as if by magic.

The use of quinine, in both forms of the complaint, should usually be preceded by the exhibition of a moderately brisk cathartic of calomel and rhubarb, to clear out the bowels and correct the secretions. When there is an acid condition of the alimentary canal, I generally combine with the cathartic a few grains of bicarbonate of soda. Thus, a most effectual beginning is made in the treatment of the disease. If the case comes under the first division, that is, if the patient is pale, thin, and habitually cold, I now begin the use of quinine, seldom alone, but commonly in combination with sulphate of iron, tartar emetic, and opium, in quantities proportionate to the age and strength of the individual. For a child, for example, of ten years, a grain and a half of quinine, one grain of iron, the twelfth of a grain of antimony, and the eighth of a grain of opium, carefully mixed, will be a suitable dose, repeated every eight hours, or, if the symptoms are urgent, even every six hours. If pills or powders are offensive to the patient, the articles may be given in solution, substituting laudanum or morphia for the opium. When there is a highly-marked strumous diathesis, the iodide of iron may sometimes be used instead of the sulphate, but in most instances I give the latter the preference. Tartar emetic I rarely omit in any case, as it is one of the most valuable remedies we possess in the treatment of scrofulous disease, both of the eye and of other parts of the body. It is a powerful controller of capillary action, and at the same time a most potent sorbefacient, rendering it thus particularly applicable when the malady is attended with a deposit of plastic matter. The opium allays pain and intolerance of light, and prevents the antimony from irritating the stomach and bowels. The quinine and iron, whether in the form of sulphate or iodide, are powerful tonics; they improve and invigorate the digestive organs, increase the fibrin and coloring matter of the blood, equalize the circulation, augment the temperature of the extremities, and powerfully aid in correcting the strumous diathesis. By means of these remedies, assisted by a proper diet and due attention to the bowels and secretions, almost any case of scrofulous ophthalmia may, in the class of patients under consideration, be effectually relieved in a comparatively short period.

An excellent cathartic, in these cases, is calomel in combination with rhubarb; to which, as above mentioned, I occasionally add a few grains of soda, especially if there is reason to suspect the existence of a redundancy of acid in the alimentary canal. In a child from three to five years of age, about two and a half grains of the former, to five or six of the latter, should be given every fourth night. Occasionally the calomel may be advantageously replaced by blue mass; or, in infants, by the gray powder.

When the skin is dry and inactive, the tepid bath may sometimes be employed, or, what is better, the body may be sponged once a day with tepid salt water, followed by frictions with a coarse dry towel. Flannel should be worn next the surface, both in summer and winter; and the greatest attention should be paid to the preservation of the temperature of the feet. When they are habitually cold, they should be plunged, twice a day, for a few minutes at a time, into cold water, and then well rubbed with a dry cloth. It is a great mistake, in such cases, to bathe the feet in warm water, with a view to the restoration and maintenance of their temperature.

In the second class of cases, where the general health is apparently but little impaired, where the countenance is florid instead of being pallid, and where the extremities are, for the most part, warm, the quinine is most advantageously conjoined with sulphate of magnesia and tartar emetic, in the form of the saline and antimonial mixture.

When the inflammation is very severe, I often omit the quinine until the disease has assumed a subacute character, and in that event also I occasionally take blood freely from the arm, or by leeches from the anterior part of the temples, within an inch of the outer commissure of the lids. In the strong and robust, iron, in every form, is totally inadmissible. The diet, too, must be more restricted, and there is a greater necessity for more active purgation. Indeed, the treatment should be strictly antiphlogistic, as much so as in inflammation of the eye from ordinary causes.

As to *counter-irritation*, collyria, and salves, so much used in this complaint, they cannot, as a general rule, be too much or too pointedly condemned. Except in the latter stages of the complaint, in some rare circumstances, it is difficult to conceive of any case in which they would be likely to be beneficial. I am only speaking my real sentiments when I declare that I know of no class of remedies which have done more mischief, or which are so well calculated to fret and annoy the patient, and to support and perpetuate the morbid action. Setons are abominably filthy and painful, and should be discarded from this branch of surgery; tartar emetic ointment and croton oil cause injurious irritation; in short, the only eligible article of this class of remedies is a small blister behind the ear, or, what is preferable, because more easily managed and more permanent, a very small issue, in this situation, made with the Vienna paste. This, when the eschar is detached, may be dressed, twice a day, with a little adhesive plaster, and will furnish a free discharge for several weeks, when, if necessary, it may easily be reopened by the application of a little more paste, or some irritating ointment.

The best *collyrium*, undoubtedly, is a solution of nitrate of silver; but, to answer the purpose, it should be very weak, and not be used until the inflammatory action is greatly diminished, when it may assist in expediting and perfecting the cure by contracting the enlarged vessels of the conjunctiva and cornea, by allaying the morbid sensibility of the eye, and by promoting the absorption of effused lymph. The strength, at first, should rarely exceed half a grain to the ounce of water, which may be gradually increased to a grain, or even twice, thrice, or four times that quantity, according to the circumstances of the case. Sulphate of zinc, acetate of lead, Goulard's extract, and similar articles are generally worse than useless.

When there are ulcers on the cornea, and they do not yield to the remedies already enumerated, they should be touched, as lightly as possible, once every other day, with the point of a camel-hair pencil wet with a solution of nitrate of silver, in the proportion of about three grains to the ounce of water; or, still more cautiously, with the nitrate of silver in substance. The former, however, is generally preferable, unless the ulcer is in a phagedenic or gangrenous condition, when the latter should take the place of the solution, as being more prompt and efficacious in its action.

The only *salve* which I ever employ in this affection is the ointment of the nitrate of mercury, in a very dilute state; generally in the proportion of about ten grains to the drachm of prepared lard. The ointment of the shops is entirely too strong, and cannot be used without the risk of materially augmenting the morbid action. Diluted in the manner here stated, it may be advantageously employed in all cases attended with great relaxation of the vessels of the affected part, opaçity of the cornea, and adhesion of the lids. The proper way to use it is to anoint, every night at bedtime, the edge of the lower lid with a small pencil, dipped in the salve, a portion not larger than half a grain of rice sufficing at each application.

Some patients experience great relief from bathing the forehead, face, and temples frequently with warm water, strongly impregnated with common salt; while others derive most benefit from bathing with cool, cold, or hot water.

The eyes must always be well protected with a green shade. Green glasses or goggles should be carefully avoided. Such a practice, indeed, cannot be too much deprecated. The same remark is applicable to compresses and bandages. I have seen numerous cases in which irreparable mischief was done by the protracted use of these articles. The true practice consists in protecting the affected organs in such a manner that, while they are sufficiently screened from the light to render the patient comfortable, they shall have the full benefit of cool air. As the disease declines, more and more light should gradually be admitted, until at length they receive their accustomed supply. Light is the natural stimulus of the eye, and must, therefore, not be withheld too long, otherwise the organ may be rendered morbidly sensitive; just as the stomach becomes irritable and unable to perform its functions when long deprived of food.

Finally, I may state that I have rarely derived any essential benefit, in the treatment of any form of scrofulous ophthalmia, from iodide of potassium, so much vaunted by some practitioners. Formerly I was in the habit of prescribing this article quite frequently, but it so often totally disappointed my expectations that I have, of late years, laid it entirely aside. In obstinate cases, we occasionally obtain benefit, especially in weakly children, requiring an alterant and tonic, from the exhibition of bichloride of mercury, in very minute doses, as the twentieth or twenty-fifth of a grain, in union with aromatic tincture of bark. I am well aware that the salt in this prescription undergoes some chemical change; but this renders it perhaps only the more efficacious. It is neither necessary nor proper to carry the remedy to the extent of ptyalism to obtain its full effects. Indeed, such an occurrence should always be carefully avoided. Cod-liver oil is frequently of great benefit, especially in the more feeble classes of cases, and should be given in such doses as the stomach will bear without nausea. When the debility is very unusual, the child should be permitted the free use of milk punch, and the lighter kinds of meat.

When there is hemicrania, or excessive circumorbital pain, anodynes are necessary, particularly at night, both to allay suffering and to procure sleep. Under such circumstances, some practitioners are in the habit of applying belladonna ointment to the affected parts, and in some cases I have found the remedy of service, though, in general, it has disappointed me.

During the latter stages of the disease, the patient should take gentle exercise daily in the open air, as a means calculated to improve his general health, and to invigorate his constitution. The greatest care should be employed to avoid exposure and indulgence of the appetite and passions. As another excellent means of preventing relapse, a moderate use of the remedies above mentioned should be persisted in for a considerable time after all disease has apparently vanished.

NEURALGIA OF THE EYE.

This affection is very common in this country, especially in the Southwestern States, and may depend for its origin either upon local or constitutional causes. In the former case, it arises most generally from disease of the eye, brain, or neighboring parts, in consequence of local congestion, if not actual inflammation, provoked by external injury, the lodgment of a foreign body, the presence of a decayed tooth, the pressure of some tumor, or excessive fatigue of the eye; in the latter, it is usually developed under the influence of miasm, disorder of the digestive apparatus, exhaustion of the nervous system, or the derangement of some important secretion. A species of neuralgia of this organ not unfrequently occurs during the progress of rheumatism, gout, and tertiary syphilis.

Neuralgia of the eye may exist as a primary affection, commencing in the organ itself, or it may be secondary, being caused by an extension of disease from the adjacent structures, especially the ophthalmic branches of the fifth pair of nerves. The latter form, according to my observation, is by far the more common of the two. The affection is most frequent in persons of a nervous, irritable temperament, and often occurs in association with neuralgia of other parts of the body. No age is exempt from it.

Of the pathology of this disorder our information is very indefinite. While in some cases it is unquestionably of an inflammatory character, as is evidenced both by the nature of the exciting cause and the peculiar features of the symptoms, in others it appears to be dependent solely upon irritation of the ophthalmic branches of the fifth pair of nerves, or upon reflex action, the consequence of derangement of the liver, stomach, bowels, kidneys, or teeth.

The disease is frequently, if, indeed, not commonly, ushered in by marked derangement of the general health, as dyspepsia, headache, constipation, flatulence, or acidity of the stomach, even when the attack depends upon a strictly local cause. The pain, which serves as its distinctive feature, is at first slight and transient, being of a sharp, lancinating character, dull, heavy, and aching, or like an electric shock, darting about in different directions, and recurring perhaps several times during the day and night. The eye, in the meantime, is morbidly sensitive, and intolerant of exposure and exertion. By and by, the suffering becomes more fixed and severe; it is deeper seated and more diffused, the lids and conjunctiva often exhibit a tumid and reddish appearance, the circumorbital pain and tenderness are great, and there is always, particularly during the height of the attack, profuse lachrymation, the tears being hot and scalding. In the more violent attacks, the forehead, temple, and upper part of the face are involved, the eyebrows are knit, the lids are spasmodically contracted, and the slightest ray of light is a source of intense agony. The pain, which is nearly always most severe at one spot, generally comes on gradually, increasing steadily until it reaches a certain point of intensity, when it slowly, if not suddenly, abates, or perhaps altogether disappears. In the miasmatic variety of neuralgia, the paroxysm, in its mode of invasion, closely resembles that of intermittent fever, the suffering recurring regularly once a day or every other day, lasting a few hours, and then going off entirely, leaving, perhaps, merely a slight degree of tenderness in the eye, orbit, temple, and forehead.

The constitutional symptoms vary. In general, they are very mild, even when the local suffering is unusually violent, being confined to some derangement of the digestive apparatus, along with more or less headache, want of appetite, and a sense of lassitude and despondency. Anything like marked fever rarely exists. It is only when the affection is very protracted, as when it depends upon organic disease of the eye, or of the ophthalmic branches of the fifth pair of nerves, that the general health is apt to become permanently impaired.

Neuralgia of the eye, or of the eye and neighboring parts, is easily distinguished by the situation and peculiarity of the pain and the history of the case. The principal affections with which it is liable to be confounded are rheumatism, gout, and tertiary syphilis.

The prognosis is usually favorable, provided the affection receives early and proper attention, otherwise it will be very liable to induce permanent blindness, whether it is originally seated in the eye or in the circumorbital region. It is, of course, unamenable to treatment when it is caused by organic disease of the brain or optic nerve.

In the *treatment*, a primary object should be the prompt detection and removal of the exciting cause. When this has been effected, the disease generally yields to the most simple measures. Gastro-enteric disorder is rectified by emetics, mercury, antacids, and other suitable remedies; the foreign body is extracted; the decayed and worrying tooth is lifted from its socket. The miasmatic form of the malady is usually speedily relieved by quinine, in doses of five to ten grains twice or thrice a day, either alone or in union with strychnia and arsenious acid. If the patient is bilious, as indicated by nausea, want of appetite, and aching of the back and limbs, the administration of the salt is preceded by an active emetic, or emetico-cathartic, to remove vitiated matter, and aid in restoring the secretions. Purging must not be neglected, and the diet must be properly regulated. When the affection is very obstinate, the most suitable general remedy is a combination of quinine, belladonna, strychnia, and arsenious acid, given in moderate doses, perseveringly continued for a number of successive weeks, with an occasional intermission of a few days.

The rheumatic form of the disease is best met with colchicum and morphia; the syphilitic, with mercury and iodide of potassium. Sometimes a change of air will effect a cure when everything else apparently fails.

During the violence of the attack, relief is sought by the exhibition of morphia and diaphoretics, sinapisms to the forehead and temple, and the immersion of the feet in hot water.

The most reliable local remedies, in a soothing as well as curative point of view, are leeches, especially when there is marked congestion or actual inflammation; vesication with ammonia or cantharidal collodion; friction with Granville's lotion, or veratria ointment; the subcutaneous injection of morphia; the application of electricity; and the use of anodyne plasters, as the opium, belladonna, or stramonium. In some cases the moxa, so highly extolled by Larrey in the treatment of this affection, will be found useful, the cauterization being made over the eyebrow, along the course of the supra-orbital nerve. Excision of this nerve has occasionally been practised, but rarely with any beneficial effect.

PYOPHTHALMITIS.

There is a peculiar, and, unfortunately, a most destructive form of inflammation of the eye, originally described under the phrase of phlebitic ophthalmitis, but which, under our improved system of nomenclature, is more appropriately designated by the term pyophthalmitis. It occurs under a variety of circumstances, and, as the name implies, owes its origin to suppurative inflammation of the veins, or to the same causes as pyemia. It has been most frequently observed in lying-in females, in connection with puerperal fever, in erysipelas and in typhoid fever, and after severe injuries and surgical operations, especially those involving the veins of the extremities.

Occurring always as a secondary affection, its attack is generally, if not invariably, coincident with symptoms of pyemia, that is, a low form of fever, preceded by rigors and accompanied by excessive nervous depression, delirium, pains in the back and limbs, swelling of the joints, great restlessness, gastric irritability, and dryness of the mouth and tongue, the latter of which is covered with a brownish coat. The eye becomes involved at a period varying, on an average, from the fourth to the tenth day, the first evidences of disease being deep-seated and excessive pains, redness and tumefaction of the conjunctiva, swelling of the lids, contraction and immobility of the pupil, and a hazy appearance of the cornea which soon runs into complete opacity. Pus is rapidly effused into the chambers of the organ, as well as among its coats, which finally slough and collapse.

The only affections with which pyophthalmitis is liable to be confounded are gonorrhœal and purulent inflammation; but from these it can always readily be distinguished by the history of the case, independently of any other consideration.

It must be obvious that a disease which runs its course with such frightful rapidity, and which is characterized from its inception by such excessive violence, can be but little influenced by treatment, however judiciously or vigorously prosecuted. The most reliable means are leeching and free division of the chemosed conjunctiva, with medicated lotions to the lids, temples, face, and forehead; active purgation; the use of the antimonial and saline mixture; and puncture of the cornea to relieve the eye from tension or intra-ocular pressure. General bleeding is seldom admissible.

OSCILLATION OF THE EYE.

This affection essentially consists, as the name implies, in an almost perpetual rotatory motion of the eye round its antero-posterior axis, occasioned by a want of harmony in the action of the oblique and straight muscles. It may be produced by a great variety of causes, some of them operating directly upon the eye, others indirectly through the brain. Of the former are congenital cataract, and albinism, or a want of black pigment, and inflammation of the choroid, retina, and iris, with or without disorganization of the vitreous humor; of the latter, apoplexy, cerebral tumors, and serous effusions, attended with permanent compression of the ophthalmic nerves. Morbid growths in the orbit may exert a similar influence. However induced, it is usually aggravated by excessive fatigue of the eye, and by whatever has a tendency to disorder the general health.

The motion of the eye in this affection varies in degree, in different cases, and under different circumstances, from the slightest aberration from the normal standard to the most disagreeable deformity. In general, it is rotatory, but now and then from side to side; the patient is entirely unconscious of it, and cannot control it, but it ceases during sleep. Vision, except in rare instances, is more or less defective, the eye is easily fatigued, and a sense of weariness is often complained of upon the slightest exertion. Shortsightedness is a common phenomenon. The prognosis is nearly always unfavorable.

The treatment is altogether empirical. Even after the removal of the exciting cause, a cure can seldom be effected, it being apparently quite impossible, in almost any case, to overcome the antagonizing action of the affected muscles. In congenital cataract the oscillation continues, in a greater or less degree, no matter how early an operation may be performed for the relief of the disease. When the motion depends upon paralysis of the muscles of the eye, or disorder of the brain, the treatment must be conducted upon general principles, and so also when it is caused by the pressure of an intra-orbital tumor.

IMMOBILITY OF THE EYE.

Immobility of the eye, technically termed luscitas, may be induced by a variety of causes, of which the most prominent are external injury, inflammation of the orbital tissues, orbital tumors, and paralysis of the ocular muscles, the result of lesion of the ophthalmic nerves, or disease of the brain and its membranes. The immobility may be complete, the patient having lost all control over the organ, or he may still be able to incline it in a certain direction, though, perhaps, with great difficulty. The affection is sometimes congenital, and is then always irremediable, especially when it is dependent upon hydrocephalus, defective organization of the brain, or the presence of some morbid growth in this organ.

In the treatment of luscitas, the first object should be to ascertain the nature of the exciting cause; when this cannot be removed, no hope can, of course, be indulged in regard to a cure.

MYOPY, OR SHORTSIGHTEDNESS.

Myopy, although it occasionally occurs in elderly persons whose vision was previously good, is usually a congenital affection, dependent either upon an extraordinary degree of convexity of the cornea or of this membrane and the crystalline lens, or upon an unnatural elongation of the globe of the eye. In either event, the effect is the same, the rays of light converging to a focus before they reach the retina, so as to fail to paint a distinct picture upon it. When shortsightedness exists in a very high degree the person cannot discern objects plainly unless they are held close to the eye; ordinarily, however, he can read small print at a distance of about nine inches. The myopic eye presents nothing peculiar, except that it is often uncommonly firm and prominent, the cornea being very convex, and the anterior chamber inordinately deep.

The only remedy for myopy is a concave glass, selected with special reference to the focal power of the eyes. When the defect occurs in a person whose future occupation is of a kind requiring good sight, the eyes should be frequently exercised upon large and distant objects, fatigue and minute vision being carefully avoided.

PRESBYOPY, OR FARSIGHTEDNESS.

In presbyopy, the converse of myopy, objects can be discerned distinctly only at a considerable distance; hence, the person in reading holds the book or paper at arm's length. Small objects are seen imperfectly at every distance, owing to the weakened power of adjusting the eye. The affection, which occasionally exists as a congenital defect, is a natural consequence of advancing age, eventuating in gradual flattening of the cornea, thus causing divergence of the rays of light before they reach the retina.

The farsightedness dependent upon old age is easily remedied by appropriate glasses, slightly magnifying objects. When the defect exists in an unusual degree, convex, or even double-convex, glasses may be necessary. The best plan generally, when the sight begins seriously to fail, is to use glasses of a very low, and to replace them as occasion may require with those of a higher, power. Great care should be taken, as in myopy, not to fatigue the eyes by over-exertion, and to avoid reading and working by artificial light.

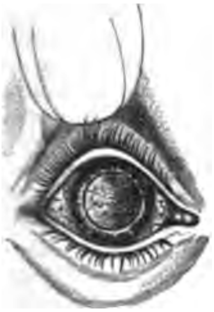
MALIGNANT DISEASES OF THE EYE.

The only two forms of malignant diseases of the eye are encephaloid and melanosis. The variety of soft cancer, known under the name of fungus hematodes, is by no means infrequent, but as it generally occurs in combination with encephaloid, and forms, in fact, merely a species of it, it does not seem to me to be entitled to separate consideration. Of scirrhus, properly so termed, I have never seen an instance in this organ, and it is questionable whether there is a perfectly reliable case of it on record, notwithstanding all that has been said respecting it.

1. *Encephaloid.*—Encephaloid of the eye generally occurs in children from the second to the tenth year; I have, however, seen it several times within less than six months after birth; and cases are occasionally met with of its occurrence rather late in life. The oldest patient in whom I have observed it was forty-two years of age. Of the influence of sex and temperament in the production of the disease in this organ nothing is known.

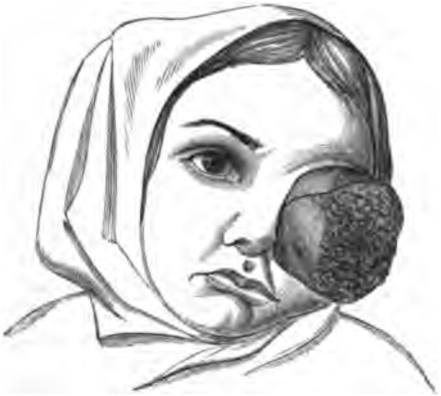
The malady always begins in the very depths of the eye, generally in the retina or choroid, from which, as it proceeds, it gradually extends to the other structures, until, at length, they are involved in one confused and disorganized mass. The earliest symptom is generally a yellowish, amber, golden, or buff-colored spot, far back in the organ, which, upon inspection, is found to look very much like the eye of a cat. This spot rapidly increases in volume, but finally entirely disappears, being replaced by dark matter; the pupil, at first sluggish, becomes permanently dilated and insensible to light; the lens is thrust forwards against the iris; and the anterior chamber is completely obliterated. These appearances are well illustrated in fig. 170 from Mackenzie.

Fig. 170.



Encephaloid, in its earlier stages.

Fig. 171.



Encephaloid of the eye; stage of ulceration.

As the malady progresses, the eye, enlarged in every direction, presents a distorted appearance; and, the cornea at length giving way, a fungous, cauliflower-looking mass is formed, which, projecting beyond the lids, soon becomes the seat of a copious, sanious, and fetid discharge, and a source of frequent and abundant hemorrhage. The patient now experiences a great deal of pain, the lymphatic ganglions in front of the ear take on disease, and the constitution exhibits all the evidences of the cancerous cachexia. Finally, hectic fever sets in, the body is rapidly emaciated, and death soon follows, from the joint effects of irritation and hemorrhage, the period which intervenes between its occurrence and the commencement of the malady varying, on an average, from six to nine months. The annexed drawing, fig. 171, from a clinical case, exhibits the appearances presented by this disease after the occurrence of ulceration.

There is no disease with which it is possible to confound encephaloid; glaucoma and amaurosis bear, it is true, some resemblance to it in its earlier stages, but any doubt upon the subject may usually be dispelled by a thorough inspection of the interior of the eye with the aid of the ophthalmoscope, which will always reveal the existence of a tumor in the one case, and the entire absence of it in the other. Besides, glaucoma and amaurosis are extremely rare in infancy, especially as simple and independent affections; hence the very fact of there being serious disease deep in the interior of the eye is calculated to awaken suspicion as to its malignant character. After the morbid growth has made some progress, its characters are generally too well marked to admit of mistake. The absence of black pigment will always distinguish encephaloid from melanosis.

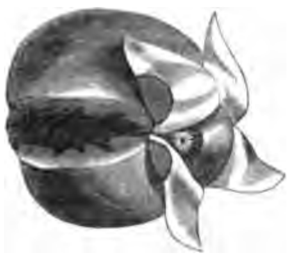
Encephaloid is always fatal; if removed, however early, it is sure to recur, or show itself elsewhere; if left to itself, it gradually involves the different structures of the orbit, and even the base of the brain and its membranes. The eyelids generally escape, although they are always much enlarged, discolored, and infiltrated with serosity.

The subjoined account of the dissection of an encephaloid eye is copied from the third edition of my Elements of Pathological Anatomy. The patient was forty-two years of age, and the tumor, which was an open, bleeding fungus, projected at least an inch and a half beyond the level of the lids.

The entire mass, after being divested of the muscles and cellulo-adipose tissues of the orbit, all of which were quite healthy, was nearly three inches in length by five and a quarter in circumference, its weight being a little upwards of two ounces. The eye itself was of the ordinary form and volume, but was thrown considerably out of its position by the morbid growth, which was of an irregularly oval shape, and sprung from the inner side of the sclerotica, near its junction with the cornea. This connection, however, was rather apparent than real; for, on tracing the heterologous mass, it became evident that it had originated in the retina, which had itself almost disappeared. The anterior surface was closely invested by the conjunctiva, which had a rough, fleecy aspect, from the morbid enlargement of its villosities; about its centre was an incrusted ulcer, three-fourths of an inch in diameter, around which the parts were somewhat knobby, and of a bluish, livid color. On cutting through this portion of the tumor, it was found to consist essentially of vessels, some of which had been opened by the erosive process, and formed the source of the frequent hemorrhages with which the patient had latterly been affected. Posteriorly, the mass was of a much lighter complexion, as well as more soft, and exhibited that peculiar tuberoid arrangement so characteristic of encephaloid.

The cornea, although still transparent, was considerably diminished in size, and adhered firmly to the iris. The sclerotica was of the natural thickness, extensively attached to the choroid, and of a yellowish buff color. The choroid itself was of a speckled, brownish appearance; at some points, it was completely disorganized; and, at one part, nearly opposite the morbid growth, there was a thin, black layer of blood beneath it. The retina, as before stated, was almost entirely destroyed; and, in place of the vitreous humor, there was a dense, solid, whitish mass, evidently the result of an effusion of fibrin. The anterior chamber of the eye was obliterated, and the iris transformed into a substance resembling fibro-cartilage. The optic nerve, near its entrance into the sclerotica, was slightly enlarged, bulbous, and pervaded by encephaloid matter. The appearance of the eye is pretty well shown in fig. 172, taken from the actual specimen.

Fig. 172.



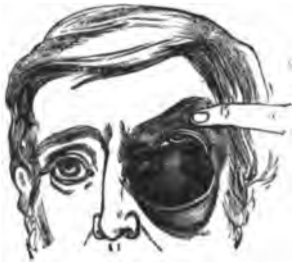
Encephaloid of the eye.

In July, 1857, I removed an encephaloid eye from a little boy, aged two years, in which the morbid mass possessed an extraordinary degree of softness throughout. It had been in progress nearly a twelvemonth, had protruded slightly beyond the lids, and had involved all the soft parts of the orbit. The lachrymal gland was remarkably indurated, as well as considerably enlarged; and the crystalline lens, of a yellowish color, and more than twice its natural size, had undergone the earthy degeneration. The encephaloid matter revealed no cancer cells.

2. *Melanosis.*—Melanosis of the eye, fig. 173, is much less common than encephaloid, with which it occasionally coexists. It is generally associated with melanosis in other parts of the body, and is rarely met with before the age of thirty-five or forty. Its starting-point is usually deep in the eye, but of its

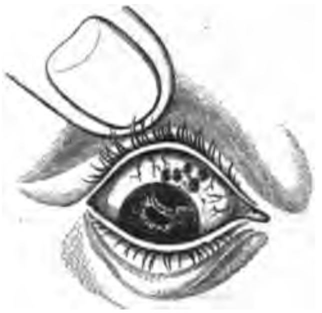
precise origin we have no knowledge, as no opportunities have hitherto been afforded for investigating this question, since the disease never proves fatal in its earlier stages. Judging, however, from analogy, and the close resemblance which melanosis bears, in its progress and termination, to encephaloid, it is extremely probable that both products have a similar origin. Be this as it may, the first evidence of melanosis of the eye is the existence of a dark, black, or purple mass deep in the vitreous body, apparently in contact with the retina, and entirely devoid of the metallic lustre so conspicuous in the other malignant disease. The pupil is crippled in its movements, vision is materially impaired, and the eye loses its natural expression. As the morbid growth extends it gradually disorganizes the humors of the eye, thrusts forward the iris, obliterates the anterior chamber, and causes ulceration of the cornea, or of the cornea and sclerotica, with a consequent fungous protrusion, from which there is always a dark, fetid, and abundant discharge, with occasional slight hemorrhage. In the latter stages of the malady the ball of the eye is generally more or less lobulated, and of a characteristic black color, not uniformly but at different points of its extent, the dark hue strikingly contrasting with the white appearance of the sclerotica. The tumor, which sometimes equals the volume of an orange, generally projects a considerable distance beyond the level of the lids. The appearances of this disease are well seen in fig. 174; the iris has been partially detached, and the mass is making its way through the sclerotica, near the cornea.

Fig. 173.



Melanosis of the eye.

Fig. 174.



Melanosis of the eyeball.

Although the *progress* of melanosis is generally considerably slower than that of encephaloid, its termination is not the less certainly fatal. The average duration of the disease is from nine to eighteen months. Sometimes a case occurs which lasts several years. There is seldom much pain until ulceration sets in, when the suffering rapidly increases, and sadly tells upon the constitution. Lymphatic involvement also now takes place; the disease gradually extends to the structures of the orbit; and death finally occurs from exhaustion, very much as in encephaloid, which it likewise resembles in its disposition to relapse after extirpation.

The only remedy for encephaloid and melanosis is *extirpation*, and that, unfortunately, is too often of a questionable character. If done at all, it should be done early and most thoroughly. If deferred until ulceration has begun, little is to be expected from such a procedure. Speedy relapse will then be inevitable. Such is certainly the result of my experience, confirmed a thousand times by that of the profession generally. During my pupilage I saw Professor George McClellan remove this organ in three instances for these affections, and in each there was a reproduction of the malady in less than a month. The patients were children under nine years of age, and in two the symptoms of the disease were such as to hold out strong inducements for the operation. I have myself extirpated the eye in nine cases, in seven for encephaloid, and in two for melanosis, and in every one, so far as I have been able to judge, mischief was done by hurrying the patient prematurely to the grave. In one instance I performed not less than three operations in almost as many weeks, first removing the ball, and then portions of the lids and neighboring parts, but all to no purpose. The patient died from the effects of the malady in a few months from the time of the first excision. In 1844 I saw a lad, thirteen years of age, upon whom Professor Mussey had already operated twice, with the result of a speedy relapse in each instance. When the case fell into my hands, some weeks after the last operation, the morbid growth had advanced so far as utterly to preclude the propriety of further interference. The youth went home, and died in a few months.

EXTIRPATION OF THE GLOBE OF THE EYE.

This operation may become necessary on account of malignant disease of the eye, especially encephaloid and melanosis. It is sufficiently easy of execution, but, as it is liable to be attended by copious hemorrhage, it should not be undertaken without proper precaution.

The patient being under the influence of chloroform, and the head firmly secured upon a low pillow, an incision is made from the outer canthus towards the temple, with a view of facilitating the remaining steps of the operation. The length of this incision need not exceed three-quarters of an inch. The tumor being transfixed by a double hook, or by a double ligature, the knife, a narrow and rather sharp-pointed bistoury, is passed circularly around it, dividing the conjunctiva, and thus separating the morbid mass from the lids. The next step is to cut the muscles of the eye a short distance behind their tendinous attachments, and finally to divide the optic nerve a few lines from its entrance into the sclerotica. Should the disease, however, be of long standing, then, instead of this procedure, which is always very simple, it will be necessary to include in the dissection all the soft structures of the orbit—muscles, celluloadipose matter, and lachrymal gland—sometimes, indeed, even the periosteum itself, and the nerve as far back as possible. The deep dissection will be much facilitated by the use of the scissors and a pair of slender dressing-forceps. The blood, which often flows in torrents, is wiped away with a sponge mop, and when the operation is over, the cavity is stuffed with lint wet with a saturated solution of persulphate of iron, a thin compress moistened with sweet oil being placed upon the lids and gently supported by a bandage. This effectually prevents further hemorrhage. Clearance of the orbit is not attempted until the establishment of suppuration.

Extirpation of the eye, performed early in life before the body has attained its full growth, is nearly always followed by a partial arrest of development of the orbit. The lids usually experience a similar fate.

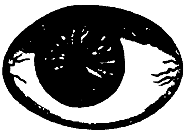
ARTIFICIAL EYE.

When an eye has been partially destroyed, the defect may often be admirably remedied by an artificial substitute; but, before this can be done to advantage, the stump of the original organ must be placed in a healthy condition, otherwise much annoyance, if not positive suffering, may ensue. For this purpose it will generally be necessary to subject the patient to a mild antiphlogistic course, and to the use of astringent collyria, in order to relieve morbid action, and induce contraction of the dilated vessels. Thickened conjunctiva, bands and bridles, inverted lashes, and, in short, whatever interferes with accurate adaptation, must receive preliminary attention. I have rectified a squinting stump by the division of the internal straight muscle, and in several instances I have been compelled to excise considerable portions of the lower lid before the patient could comfortably wear the false eye.

The best stump for an artificial eye is one which has sustained very little loss, and which, consequently, is just a little below the natural size. A collapsed ball does not afford adequate support, and the case is still worse when the eye has been extirpated. It is very important also that the stump should retain its muscular power, otherwise it will be impossible for it to move in concert with the sound organ. The morbid sensibility and pain so frequently experienced in wearing an artificial eye are generally dependent upon the cornea, and it is, therefore, a good rule, whenever the surgeon has his choice, to remove the whole of this membrane as a preliminary measure. A want of attention to this point might seriously endanger the safety of the sound eye.

An artificial eye, fig. 175, is merely a thin light shell of enamel, highly polished, almost hemispherical in shape, and accurately corresponding in size and color to the sound organ. Establishments for its manufacture exist both in this country and in Europe, and there are persons who make it a special business to adapt it to the wants of each particular case. To obtain a good fit, the patient should apply in person, or, if this is impracticable, send a proper model instead, accompanied with a drawing of the natural color and appearance of the healthy eye.

Fig. 175.



The insertion of a false eye is readily effected after it has been dipped in cold water by passing it, with the broad end outwards, under the upper lid, and then holding it there with the forefinger of one hand, while the lower lid is forcibly depressed with the other until the edge of the shell sinks into the inferior palpebral sulcus. Removal is accomplished by an opposite procedure, that is, by drawing down the lower lid, and insinuating a hook, a large pin, or a piece of wire, beneath the lower edge of the disc, which, lest it fall and break, should be received into the hand or dropped upon some soft substance.

As cleanliness is of the greatest importance, the eye should be taken out every night at bedtime, and immediately well washed; the stump and lids should also be thoroughly bathed, and any undue irritation that may arise should be promptly combated by suitable collyria and aperients. At first the eye should not be worn longer than a few hours each day, but as the parts become accustomed to its presence the interval may gradually be increased. In about a year a new one will probably be required, the old being rendered useless by the corrosive action of the humors of the diseased organ.

DISEASES AND INJURIES OF THE LACHRYMAL APPARATUS.

The lachrymal organs consist of the lachrymal gland, canals, and sac, together with the nasal duct, which are all liable to inflammation and its effects, and also to some of the heterologous formations, either as primary or secondary affections.

a. Lachrymal Gland.—The principal affections of this little body are inflammation, encysted tumors, and chronic enlargement.

1. Inflammation of the lachrymal gland, technically called *dacryadenitis*, is so very rare that many practitioners have doubted, though erroneously, the possibility of its occurrence. It is mostly seen in young subjects of a strumous diathesis, and is commonly produced by the effects of cold or external injury. In disease of the globe and orbit the gland is sometimes involved secondarily, and this, in fact, appears to be the way in which it usually suffers, idiopathic disease being exceedingly infrequent. There are no signs by which the affection can be discriminated from other maladies in its immediate vicinity; but its presence may always be suspected when there is pain, more or less severe, in the situation of the gland, accompanied with swelling and tenderness on pressure. Confirmatory evidence is afforded by the absence of lachrymal secretion, or the existence of inordinate dryness of the conjunctiva, œdema, pain and tension of the upper lid, and displacement of the ball of the eye, which is generally pushed somewhat downwards and inwards by the pressure of the enlarged gland, as well as embarrassed in its movements. The conjunctiva always participates in the inflammation, becoming red and painful; the periosteum of the orbit is also liable to be involved, and the bone itself may ultimately be attacked. Fever and headache are among the more common symptoms, and in many cases the patient is delirious.

Dacryadenitis may terminate in abscess, or pass into the chronic form, the gland remaining enlarged and tender for many months. The formation of matter is usually indicated by the occurrence of delirium, or an increase of it if it previously existed, a disposition to rigors, and an aggravation of the circumorbital inflammation.

The *treatment* is rigidly antiphlogistic; by general bleeding if there is much suffering conjoined with plethora; by leeches to the outer part of the upper lid, forehead, and temple; by active purgation; by the antimonial and saline mixture; and by the application of medicated dressings, either in the form of light poultices or fomentations. If suppuration occur, the matter is evacuated by an early incision through the upper part of the conjunctiva, beneath the corresponding lid. The chronic form of the disease is combated by milder means; principally by purgatives, occasional leeching, and alterant tonics. Now and then the puncture made for the relief of the abscess is disposed to remain fistulous and must then be lightly touched, from time to time, with nitrate of silver or the end of a fine probe, dipped in a weak solution of acid nitrate of mercury.

2. An *encysted tumor* occasionally forms in the lachrymal gland, in consequence, apparently, of the obstruction of one of the lachrymal ducts, and the retention of lachrymal fluid. The contents of the cyst are of a whitish color, of a thin, watery consistence, and of a saline taste; sometimes they are thick and viscid, like synovia. The tumor varies in volume from that of a pea to that of an almond; it is irregular in shape, bears a very close resemblance, in its appearance, to a small bladder, consists of a single layer, and is always unilocular. In the few cases in which it has hitherto been observed it occurred in young subjects, under thirty years of age. The diagnosis of the affection is necessarily obscure, if not altogether uncertain. When the tumor approaches the surface, and has an elastic, or semi-elastic feel, an exploring needle, carefully inserted, may assist in determining the nature of the case; but, in general, this can be done only by an incision, large enough to expose its surface. The eyeball is usually displaced forwards and inwards, but as this protrusion may be caused by other affections, such, for instance, as tumors of the orbit, entirely unconnected with this gland, it is evident that no useful hints can be deduced from that circumstance.

The *treatment* is conducted upon the same principles as that of encysted formations in other parts of the body. The safest remedy is an injection of a very weak solution of iodine, or the introduction of a little mercurial ointment, to excite inflammation and an effusion of plasma. Extirpation of the sac should only be attempted when the tumor is large and indisposed to yield to other and milder means.

3. The lachrymal gland is liable to *chronic enlargement*, attended with induration and other textural changes, producing a state of things which has occasionally been confounded with true scirrhus, a disease which is probably never developed in this organ. What countenances this opinion is, first, that the enlargement and induration often take place in young subjects, long before the period for the appearance of scirrhus in other situations; and, secondly, that dissection, however carefully conducted, always fails to disclose the characteristic structure of this heterologous product. Nevertheless, I do not feel inclined altogether to deny the possibility of the occurrence of scirrhus, much less of encephaloid, in this gland; for it is unquestionable that, in not a few of the reported cases, the enlargement of this organ was carried to a most extraordinary extent; far, indeed, beyond what might be supposed to have happened had the disease been of a benign nature. Moreover, it is certain that the gland is liable to be affected secondarily by cancer, as is seen in encephaloid of the globe of the eye, and in epithelioma of the lids and orbit. The surgeon must, therefore, often be in doubt respecting the real nature of these tumors. Hence, it will be a good rule to extirpate them without delay, whenever they are at all of a suspicious character, or whenever it is found that they are not amenable to the ordinary discutient means.

4. *Extirpation* of this body is accomplished by making an incision through the outer commissure of the lids, and raising the upper flap from the corresponding portion of the ball; a procedure altogether preferable to cutting through the substance of the lid, as generally advised by surgeons. The enlarged gland

being thus exposed is carefully liberated with the finger or handle of the scalpel, and lifted from its bed along with any other suspicious-looking structure. The cutaneous wound is approximated by suture, and supported by a light compress, confined by adhesive strips.

b. Lachrymal Canals.—These little passages, which convey the lachrymal secretion to the tear-bag, are liable to laceration, inflammation, obstruction, and stricture.

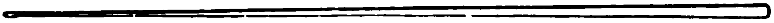
Laceration of the lachrymal tubes is one of the effects incident to injury in this region, being usually caused by a blow, or by a fracture of the nasal and maxillary bones. Walton mentions an instance in which it was produced by a slight scratch on the inner corner of the eye in a scuffle. It is characterized by a puffy, emphysematous swelling, crackling under the finger, and gradually spreading over the cheeks and eyelids, which are sometimes completely closed. The symptoms generally disappear spontaneously in a few days.

Inflammation of these passages, whether originating there, or propagated to them from the neighboring structures, is attended with thickening of the lining membrane, more or less uneasiness, muco-purulent discharge and watering of the eye, the tears being unable to reach their natural destination. The subjects of the disease are generally persons of a strumous predisposition, who are very prone to take cold, and to suffer from other ophthalmic affections, especially chronic conjunctivitis. Indeed, we seldom meet with inflammation of these canals without this complication. The proper remedies are attention to the general health, which is often much impaired, and gentle, but steady, purgation, with a leech occasionally to the inner canthus, and the use of slightly astringent injections.

Obstruction of the lachrymal canals may be produced in different ways; as chronic thickening of their lining membrane, direct adhesion of their walls, or deposit of lymph in the submucous cellular tissue. It may also be caused by the presence of an earthy concretion, a detached and intercepted eyelash, fibrin or inspissated mucus. A wound of these passages is a serious accident, inasmuch as it is very liable to be followed by loss of function. The closure, however induced, may be partial or complete, temporary or permanent: in some cases it affects merely the orifices of the tubes. The characteristic symptom is epiphora; but the nature and situation of the obstruction can only be determined by an examination with the probe.

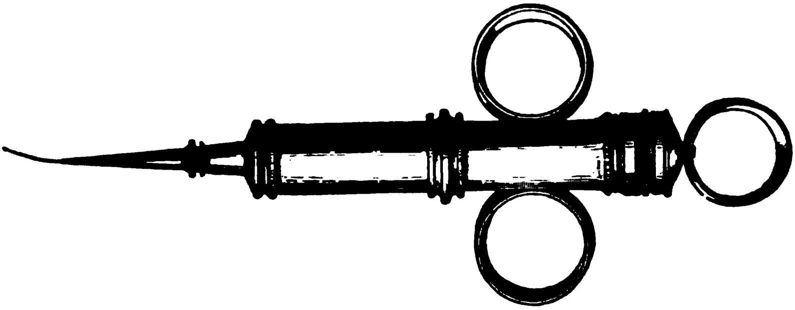
When the obstruction is extensive, or dependent upon firm adhesion, or the presence of organized lymph, no benefit will be likely to result from treatment; under opposite circumstances, relief should be attempted by gradual dilatation,

Fig. 176.



Anel's probe.

Fig. 177.

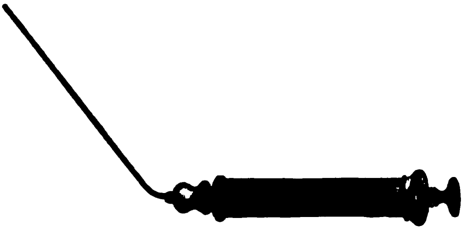


Anel's syringe.

and mildly astringent injections, the proper instruments for performing these operations being Anel's probe and syringe, depicted in figs. 176 and 177. Great tact and caution are necessary in the use of these instruments, otherwise they will be sure to increase the disease instead of diminishing it. The probe should not, at first, be introduced oftener than once every fourth or fifth day, and the operation should never be commenced without some preliminary treatment, with a view of rendering the parts more tolerant of manipulation. The eye should always be well bathed for some time after the passage of the instrument, and, if considerable irritation arise, a brisk purgative must be given, and a leech applied to the inner canthus. The dilatation may generally be greatly promoted by the daily use of some astringent injection, composed, for example, of the eighth of a grain of nitrate of silver to the ounce of water, or a weak solution of zinc, alum, or lead. Without, however, some constitutional treatment, local measures will generally afford very little benefit; and even then, under the most favorable circumstances, much time and patience will be required to effect a permanent cure.

An ingenious instrument, combining in its construction the principles of a syringe and a probe, was recently devised by Dr. E. Macfarlan, of New York, and may generally be advantageously employed for completing the cure of lachrymal and nasal obstructions. The annexed sketch, fig. 178, conveys an accurate idea of it. A full account of it may be found in the American Medical Times for July, 1864.

Fig. 178.



Macfarlan's lachrymal probe-syringe.

Foreign bodies in the lachrymal canal must be extracted with the forceps, or forceps and knife. The intruded eyelash is sometimes siezed with difficulty, owing to the fact that it is almost completely buried in the passage.

It sometimes happens, in consequence of accident or disease, that the orifice of the inferior lachrymal canal is seriously displaced, being turned forwards or upwards, away from the ball of the eye, so as to allow the tears to flow over the edge of the lid. When this is the case, relief may be afforded by a very simple operation, suggested by Mr. Bowman, of London, consisting in the complete division of the canal by means of a very delicate knife, carried from below upwards over a grooved director. During the after-treatment care must be taken to prevent the edges of the incision from growing together, by the occasional use of a probe. The object of this procedure is to extend the orifice of the duct backwards to the point where the tears naturally accumulate.

When the orifice of this canal is obliterated, the canal itself remaining pervious, an incision should be made just below the seat of the obstruction, across the tube, which should then be slit up on a probe.

c. *Lachrymal Sac.*—The tear-bag is liable to laceration, inflammation, both acute and chronic, abscess, and fistule.

1. *Laceration* of the lachrymal sac usually occurs as a complication of fracture of the nasal and maxillary bones. In a case related by Dr. Taylor it was occasioned by blowing the nose. However induced, it is liable to be followed by excessive swelling of the parts, with a tendency to emphysema, the formation of abscesses, and obliteration of the sac from inflammatory deposits. To prevent these untoward effects, the treatment should be prompt and vigorous, our main reliance being upon leeches and cold water-dressing, with active purgation.

2. Inflammation of the lachrymal sac, the *dacryocystitis* of ophthalmologists, commonly occurs in strumous and syphilitic subjects, either from exposure to cold, disease of the neighboring structures, or, as is more generally the case, from obstruction of the nasal canal, the inferior outlet of the sac. The sac, under these circumstances, is placed in the same condition as the urinary bladder in stricture of the urethra, or chronic enlargement of the prostate gland. In either

event there is retention of the natural contents of the reservoir, which, undergoing chemical decomposition, become thereby a source of inflammation, suppuration, and even ulceration. I imagine that most of the more simple cases of dacryocystitis are induced in this way. The disease may occur at any period of life, but is uncommon in infancy and childhood.

The acute form of the malady is characterized by unusual violence, the symptoms, both local and constitutional, being generally much more severe than the size and importance of the affected part would seem to justify. The reason, however, is sufficiently apparent when we reflect upon the organization of the sac, and the nature of the structures immediately around it. The disease begins in the form of a hard, circumscribed swelling, just below the tendon of the orbicular muscle which, gradually increasing in bulk, soon becomes the seat of the most exquisite pain, deep-seated, tensive, throbbing, and extending about in different directions; the skin has a red, erysipelatous look, and slightly pits on pressure; the eyelids, cheek, and nose are deeply involved in the morbid action; the lachrymal canals no longer perform their office; there is high fever, with agonizing headache; and the patient is often violently delirious. If the excitement is not arrested, as it rarely will be when it has attained this height, suppuration will set in, thus greatly augmenting the suffering.

The *treatment* of acute dacryocystitis is rigidly antiphlogistic. Leeching, and even venesection, may be necessary; purgatives and antimonials are freely used, along with anodynes, to allay pain and promote sleep; and the parts, painted several times a day with dilute tincture of iodine, are kept constantly wet with a strong solution of acetate of lead and opium. A small blister applied to the part is occasionally of great service.

3. The formation of *abscess* of the lachrymal sac is denoted by the pointed character of the swelling, by the erysipelatous blush of the skin, by the throbbing nature of the pain, and by the sense of fluctuation, which is always present when the matter has made some progress towards the surface. In that event, too, there is often a small vesicle of the epidermis with an attenuated state of the skin, showing where the abscess, if left to itself, will ultimately open.

The *treatment* of the disease is, obviously, by incision, large enough to afford free vent to the pent-up fluid, and the earlier the operation is performed the better both for the part and system. The tendon of the orbicular muscle, made tense, serves as a guide to the knife, which is carried perpendicularly down over the most prominent part of the swelling. A very small tent is inserted to insure patency of the wound.

The inflammation having subsided, the artificial opening gradually closes, though, in general, it will manifest a disposition to remain, especially if there is any obstruction in the nasal canal, or disease of the lachrymal bone, as may happen when the affection is of a strumous or syphilitic origin. In such a case the bone may be completely necrosed, and consequently require removal. When the sac remains open, or breaks at intervals, it discharges more or less pus, or puriform mucus, constituting what has been called *mucocele*. Under such circumstances, the cure may be promoted by astringent injections, or simply by washing out the sac several times a day with tepid water and soap, or common table tea.

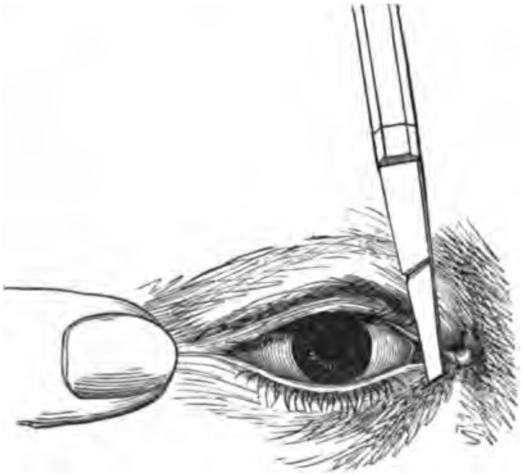
4. *Chronic dacryocystitis* is often a troublesome and obstinate disease, as annoying to the practitioner as it is disagreeable to the patient. It may be a sequela of the acute form of the malady, or it may exist as an original lesion, coming on gradually and stealthily, without any evident cause, and unaccompanied by any marked symptoms. It is most common in strumous persons, in consequence of attacks of measles, scarlatina, and smallpox, and frequently lasts for months and years, meanwhile producing serious structural changes, particularly thickening of the lining membrane, and obstruction of the lachrymal and nasal ducts. Sometimes it is dependent upon disease of the pituitary membrane, caries of the bones of the nose, or the presence of a nasal polyp.

The disease is recognized by a small tumor at the side of the nose just below the tendon of the orbicular muscle, and by a constant feeling of uneasiness of the part; there is generally some inflammation of the conjunctiva and lids, and occasionally, though not always, some discoloration of the skin in the situation of the sac. The swelling is caused by the retention of the tears and the accumulation of the mucous secretion; two circumstances which materially serve to keep up the morbid action. By pressing the tumor gently with the finger, its contents may be made to discharge themselves through the lachrymal canal, and partly, also, through the nasal duct; this, indeed, is the method usually adopted by the patient to obtain temporary relief, the operation being often performed three or four times a day. Epiphora, or watering of the eye, is generally another of the annoyances experienced by persons laboring under this affection.

Chronic dacryocystitis is treated upon the same principles as the acute form of the disease, only that our remedies must be plied less vigorously. Attention to the general health is indispensable in all cases; the secretions, which are often much at fault, must early be corrected; the diet must be properly regulated; and the bowels must be kept under the influence of mild purgatives, containing a small quantity of blue mass or calomel. Locally, the best application is a leech, renewed every six or eight days, use being made, in the interval, of the dilute tincture of iodine, painted upon the skin over the sac once every twenty-four hours. Benefit, of a very important character, will also accrue from the daily use of mildly astringent injections, thrown into the sac along the lower lachrymal canal with an Anel's syringe. We cannot be too careful, however, in the use of these means; for, should they be at all irritating, the morbid action will be sure to be increased instead of being diminished. The practitioner has a great variety of articles from which to select, and he has only to be careful that he properly graduates their strength to the tolerance of the parts. When the disease is dependent, as it often is, upon partial obstruction of the nasal duct, an attempt should be made to effect clearance with the probe, used upon the same principle as in the corresponding affection of the lachrymal canals.

The introduction of the probe necessarily involves a very thorough acquaintance with the anatomy of the lachrymal passages. The operation is usually performed upon the inferior canal while the patient is seated upon a chair with his head resting against the breast of the surgeon. The lower lid being made slightly tense by placing a finger over the outer commissure, the probe is inserted from above downwards, and gradually brought to a horizontal position, until the point reaches the farther side of the sac; the instrument, being now raised against the superciliary arch, is passed steadily downwards, with a slight inclination backwards, along the nasal canal, into the inferior chamber of the nose, care being taken to execute the whole proceeding in the gentlest possible manner. The operation is repeated at first twice a week, then every other day, and finally every twenty-four hours, until all necessity for its employment ceases.

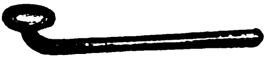
Fig. 179.



Operation for relieving the nasal duct.

If this plan should fail, and an abscess be threatened, the sac should be laid open, and a style worn in the nasal duct. The patient being seated upon a chair, with his head supported upon the breast of an assistant, the surgeon, standing behind him, stretches the tendon of the orbicular muscle by placing his finger over the outer commissure, and, taking the tendon as his guide, he plunges a narrow, sharp-pointed bistoury, held almost horizontally, into the sac, and then finishes the operation by bringing the instrument in the vertical position, and cutting from within outwards. The annexed cut, fig. 179, exhibits the manner in which the operation is usually done. A style made of silver, from ten to twelve lines long, and represented in fig. 180, is immediately conveyed into the nasal duct, its head protruding at the orifice of the wound, where, if there is any danger of its falling into the sac, it may easily be secured by a little thread, passed through an aperture in the instrument, and fastened to the side of the nose with a bit of court-plaster. The style is occasionally withdrawn and cleansed. Instead of this instrument the surgeon may use a piece of catgut or unoiled sole leather, or, what is preferable, a bougie of slippery elm, which, while it is easy of introduction, has the effect of rapid expansion, thus greatly expediting the dilatation.

Fig. 180.



Style for the nasal duct.

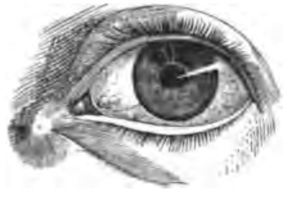
When the duct is firmly closed, it may be necessary, as a preliminary to the insertion of the style or bougie, to effect clearance with a common pocket probe. If the obstruction is irremovable, the proper plan is to drill a suitable opening—a pretty large one—into the lower portion of the lachrymal bone, to allow the tears and mucus to pass into the upper chamber of the nose.

When the obstruction is overcome, some surgeons, instead of using a style, insert a silver tube, left permanently in the passage. This practice, however, is highly objectionable, as the instrument is liable not only to create irritation in the passage, but, from the action of the tears, mucus, and pus, to become eroded and decomposed. Many years ago I met with an instance in which such an instrument had escaped from the nasal duct, and perforated the upper jaw.

5. *Fistule* of the lachrymal sac is nearly always the result of abscess, dependent upon closure, partial or complete, of the nasal duct. It may, it is true, result from wound, but such an occurrence is quite uncommon. Disease of the lachrymal and turbinated bones, or of the pituitary membrane, and various morbid growths of the nose, as polyps and exostoses, may also give rise to it. A congenital lachrymal fistule is occasionally met with.

The external opening in lachrymal fistule is usually situated just below the tendon of the orbicular muscle, as in fig. 181, and is subject to temporary closure. The discharge is either mucopurulent, or mucous, being of a yellowish or whitish appearance, and of a thick, ropy consistence; the parts around are generally somewhat tender and inflamed, and the tears often flow over the cheeks, in consequence of the congested condition of the lachrymal passages.

Fig. 181.



Lachrymal fistule in its chronic stage.

As the cause of this affection is obstruction of the nasal duct, it is evident that the only remedy is its removal. This is to be accomplished in the manner already pointed out under the head of chronic inflammation; but before any measures of this kind are adopted, we should endeavor to get rid of any existing complications, and for this purpose it may be necessary to subject the patient to several weeks' preparation, by leeching, dieting, and purgation. Too much attention cannot be paid to this advice, of the benefits of which I have often had the happiest proof in the rapid progress of the treatment. When the patency of the nasal duct has been re-established, the fistule will usually close spontaneously in a few days; should it be slow in healing, the cicatrization may be promoted by the application of nitrate of silver, or a weak solution of acid nitrate of mercury. In several of my cases the orifice closed promptly, after the failure of other means, under the use of a small blister.

6. Having already spoken of the principal *diseases* of the nasal duct, and the means of overcoming them, in connection with inflammation and fistule, it is not necessary to enter into any formal disquisition of them here. This is the less called for, because they are of infrequent occurrence, most obscure in their diagnosis, and, in great degree, beyond the reach of remedies.

INJURIES AND DISEASES OF THE LIDS.

The lids are subject to various affections, some of which are peculiar to them, others common to them and other parts of the body. The most important of these affections are wounds, boils, tumors, malpositions, paralysis, and inflammation.

1. *Wounds* of the lids must be treated on general principles. A clean cut should be united by suture, with wire in preference to thread, introduced in such a manner as not to interfere with the mucous membrane, or even, if it can be avoided, the tarsal cartilage. Pins are quite out of the question, and plaster alone should never be trusted to on account of the great mobility of the parts. The nicest adaptation of the divided surfaces is to be aimed at, as any malapproximation is liable to be followed by trichiasis, entropion, or ectropion.

When a lid is severed from its connections, torn through at the centre, or divided at its commissure, the edges should be well trimmed, and then united by suture, aided by adhesive strips. Occasionally a compress and bandage will be required; but, in general, the globe of the eye will afford sufficient support to the affected parts. When the lachrymal point is involved in the laceration, the greatest care should be exercised to prevent its closure.

Wounds of the eyebrows demand the same attention as similar lesions of the lids, both in regard to accuracy of adaptation and retentive measures.

A disfiguring cicatrice of these parts may often be advantageously dissected out, and exchanged for a more seemly one; but such a procedure usually requires proper preparation of the system, lest, erysipelas arising, the beauty of the result be thus marred.

2. A *congenital fissure* sometimes occurs in the eyelids, especially in the upper; it may exist by itself, or in union with hare-lip, or with hare-lip and cleft of the iris, as in a case observed by Heyfelder. The defect is rectified by an operation similar to that for hare-lip, apposition being maintained by the finest suture and isinglass plaster.

3. *Emphysema* of the lids may arise from external injury, from disease, or from blowing the nose violently. A case of this occurrence, from a gunshot wound of the frontal sinus, is related by Baudens. In the majority of instances, the air gains admission from the nasal cavity, in consequence of ulceration or rupture of the Schneiderian membrane. The characteristic symptoms are, a tumid condition of the affected lids, and a peculiar crackling sensation perceived on pressing them with the finger. The affection generally rapidly disappears under the application of cold water and a dose of aperient medicine. When the distension is very great, a few punctures may be made into the skin.

4. A *stye* is a small, inflammatory swelling at the edge of the lid, of a furuncular nature, attended with pain, heat, and itching, with a tendency to suppuration. It is, in fact, nothing but a boil, modified by the structure of the parts in which it is developed. The matter is thick, unhealthy, and usually contained in a small slough, or intermixed with spoiled lymph. The disease probably has its origin in one of the bulbs of the cilia, and is most frequently met with in persons of a strumous constitution, laboring under derangement of the digestive apparatus. I have seen it much oftener in females than in males, particularly in young girls, who take but little exercise, and are subject to irregularity of the menses. Some individuals are peculiarly prone to this disease, suffering almost habitually for months together, one stye appearing after another, or each having a disposition to assume a chronic course. The upper lid is more frequently affected than the lower.

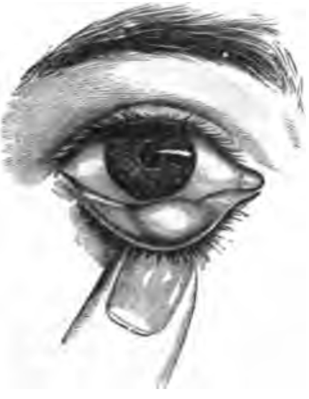
The proper practice is to encourage the suppurative process with warm fomentations, or a light elm poultice, and to puncture the swelling as soon as matter has fairly begun to form. If the stye is very painful, a leech may be applied to its surface, and a brisk cathartic directed. When the affection becomes chronic, or has a tendency to frequent recurrence, special attention must be paid to the correction of functional derangement, by the use of purgatives, alterants, tonics, and a judicious regulation of the diet. The best local remedies are a weak solution of iodine, and slight scarification, to relieve vascular engorgement.

5. Various kinds of *tumors*—horny, warty, sebaceous, encysted, serous, hairy, benign and malignant—form upon the lids, in their substance, or along their free edges; but as they do not differ from similar formations in other regions, it is not necessary to enter into any elaborate account of their nature and treatment. Most of them are easily recognized and treated, the proper remedy being excision, performed as soon as the morbid growth acts hinderingly or disfiguringly. Those seated along the edge of the lid may usually be snipped off with the scissors, or, if the patient dreads pain, they may be removed with the ligature; any tendency to reproduction being afterwards repressed with nitrate of silver. When the tumor occupies the substance of the lid, a horizontal incision, embracing the skin and fibres of the orbicular muscle, is made across it, when it may be seized with the tenaculum, and either dissected or dug out, as may be most convenient, care being taken, if it is encysted, not to leave any of the sac behind, nor, in any case, to injure the palpebral cartilage. The edges of the wound are approximated by the interrupted suture, which is the only dressing required.

One of the most common tumors in the upper lid—it does not occur in the lower—is the *fatty*, which often attains the size of a currant, in the course of two or three months, and is productive of more or less impediment of motion, as well as of some degree of soreness. It is almost always associated with derangement of the digestive organs, occurs at various periods of life, sometimes even in young children, and generally originates in the cellular tissue between the orbicular muscle and the palpebral cartilage. It is usually somewhat globular in shape, hard to the touch, and unaccompanied with discoloration of the skin. Its pressure sometimes causes partial absorption of the cartilage. Laid open, it is found to consist of a soft, fatty substance, frequently intermixed with a few drops of pus, and contained in an imperfect cyst. The term fatty tumor is the most appropriate one for it. The proper remedy is excision; it never recurs, but similar growths are liable to form in its vicinity. Attention to the constitution is generally necessary to counteract this tendency.

A *fibrous tumor* is not unfrequently met with in the lids, especially in the upper; it is usually solitary, of a rounded or ovoidal shape, of a dense consistence, and of an imperfect fibrous structure. Situated between the orbicular muscle and the fibro-cartilage, its tendency is to perforate this substance, and, as it increases, to extend towards the inner surface of the lid, where it often presents itself as a soft fungous, vascular excrescence. Such a growth is seen in fig. 182, from Mackenzie. The proper remedy is excision, performed by carrying the knife horizontally across the lid. No local applications are of any avail.

Fig. 182.

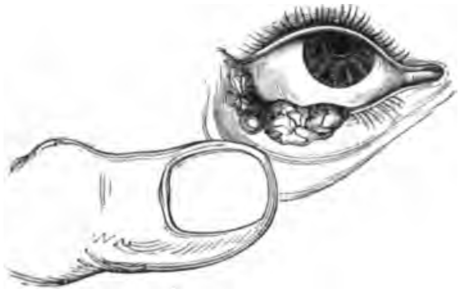


Fibroid tumor of the lower lid.

Wart-like *excrescences*, of a florid color, and of a soft, fleshy consistence, are sometimes seen upon the inner surface of the lids; they are generally small, and, when attached by a narrow pedicle, occasionally exhibit an appearance similar to that of a nasal polyp. Removal is readily effected with the scissors, and repullulation prevented by means of sulphate of copper.

Carcinoma of the eyelids, generally in the form of epithelioma, fig. 183, occasionally presents itself, either as an original affection or as a secondary involvement. In the former case, it usually begins as a fissure, a shot-like tubercle, or a warty excrescence either at the free border of the lids or in their cutaneous structure, and gradually involves their entire thickness, thus producing a foul, painful, and intractable ulcer. Care must be taken not to confound the disease with syphilis. Its slow progress, the puckered condition of the affected parts, and the slight swelling which attends it will generally be sufficient to establish the diagnosis. Elderly persons are most subject to it; and it is more common in the lower lid than in the upper. The treatment is the same as in cancer in other situations.

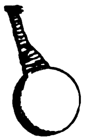
Fig. 183.



Epithelioma of the lower lid.

Several cases—probably four or five—have been recorded in which the lower lid was the seat of a small tumor, containing a *cellular cysticerce*, fig. 184. The patients have nearly all been children, the subjects of slight injury, as a blow or contusion. Such a tumor cannot, of course, be diagnosticated previously to its removal.

Fig. 184.



Cysticerce of the lower lid.

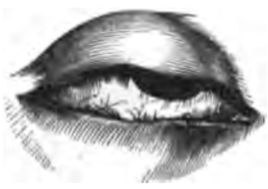
6. *Syphilis* of the eyelids may occur from direct inoculation or as an effect of a constitutional taint. In either event, the disease usually attacks the edge of the lids, in the form of an irregular ulcer, with hard everted edges, and a foul, unhealthy bottom, with little discharge. Sometimes the disease breaks out upon the surface of the lids, from which it gradually extends until it causes complete perforation. Considerable pain and swelling with œdema of the conjunctiva generally attend its progress; and these phenomena, together with its great obstinacy, always serve to distinguish it from carcinoma. Not unfrequently evidence of syphilis exists in other parts of the body.

Syphilis of the lids is sometimes congenital, evidences of its effects showing themselves within a few weeks after birth. The infant is always puny, and covered with scales, scabs and pustules, along with copper-colored blotches, and excoriations about the anus, nose, lips, and ears.

The treatment is by mercury and iodide of potassium, assisted by the topical application of nitrate of silver and of the dilute ointment of acid nitrate of mercury.

7. Inversion of the lids, as seen in fig. 185, the *entropion* of ophthalmologists, is generally the result of severe and protracted inflammation of the eye, attended with excessive intolerance of light, compelling the patient to make constant and powerful efforts to exclude it from the retina. The consequence is that the lids are drawn with great firmness over the ball, not several times during the day, but incessantly, thus inducing relaxation of the skin and orbicular muscle, and, also, as a necessary result, inversion of the cilia. Granular and strumous diseases of the eye are, according to my observation, the most common causes of entropion; cases occasionally occur where it is produced by very slight inflammation, especially if, as not unfrequently happens, the individual has naturally a very redundant lid, or a sort of hypertrophous condition of its cutaneous and muscular tissues.

Fig. 185.



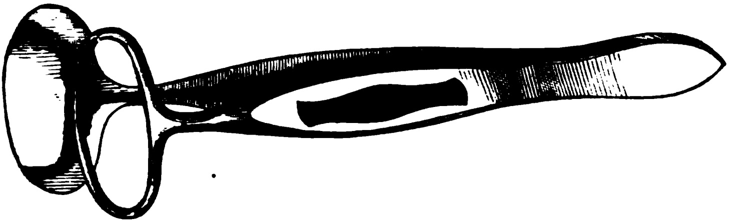
Entropion of both lids.

Entropion sometimes affects all the lids, either simultaneously or successively, as I have witnessed in a considerable number of cases; more commonly, however, it is limited to one or two. In degree it varies from the slightest change in the natural position of the organ to the complete curling up of its inner edge, the cilia being perfectly concealed from view. In the advanced stage of the affection the skin of the lid is thrown into numerous horizontal folds, the fibres of the orbicular muscle are stretched and relaxed, the tarsal cartilage is rendered concave in its vertical diameter, and the lashes are stiff and straggling.

The injurious effects which entropion exerts upon the eye may readily be imagined. The lashes, constantly pressed against the anterior part of the ball, fret and irritate the conjunctiva and cornea, keeping up inflammation, with mucopurulent discharge, profuse lachrymation, and intolerance of light. The mischief is particularly apparent in the cornea, which, in consequence of the friction of the lid, soon becomes the seat of plastic deposits, interfering with the transmission of light, and often eventuating in total blindness.

Although various remedies have been suggested for the cure of this disease, the only one at all worthy of reliance is excision of an elliptical portion of integument, extending from one extremity of the lid to the other, and embracing a few of the fibres of the orbicular muscle. Much judgment is required in order accurately to proportion the amount of substance to be removed; the great danger generally is that the operator takes away too little, thus favoring speedy relapse. Particular instruments, as that, for example, sketched in fig. 186, have been devised for pinching up the skin and giving the flap a proper shape; but the scientific surgeon needs no such aid, a pair of dissecting forceps and scissors being quite sufficient for his purpose. Excision having been effected, the edges of the wound are neatly tacked together by three or four points of suture, to be removed at the end of the third day. Very little, if any, after-treatment will be required. If all the lids are inverted they may be operated upon at one sitting, as I have done in numerous instances.

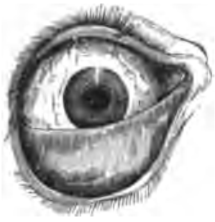
Fig. 186.



Entropion forceps.

8. *Ectropion*, exhibited in fig. 187, the reverse of the above condition, may be caused by long-continued inflammation, attended with excessive thickening of the conjunctiva, as in granular lid; but in the great majority of cases it is produced by the contraction of vicious cicatrices, especially by such as are the result of scalds, burns, and escharotic applications. Loschge, Schiette, and others have witnessed ectropion as a congenital malformation.

Fig. 187.

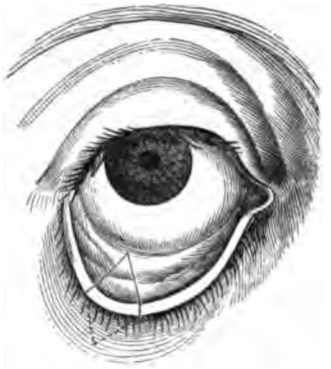


Ectropion of the lower eyelid.

The eversion presents itself in various degrees, being sometimes very slight, and at other times so great as to turn the lid completely inside out, hanging off from the eye like a shutter. However this may be, it is always accompanied by an inflamed, thickened, and indurated condition of the palpebral conjunctiva, and generally also by more or less disease of the eye, owing to the constant exposure of the ball to light and dust. In cases of long standing the ocular conjunctiva is dry and hypertrophied, and the cornea often exhibits opaque specks, obstructing vision. The affection is most common in the lower lid, and, in its worst forms, is often attended with a remarkable elongation of the part in its horizontal diameter, so that the lid is not only everted but turned away considerably from the ball.

Slight ectropion, depending upon inflammation, may sometimes be relieved solely by antiphlogistic means, which, by promoting the contraction of the enfeebled and relaxed structures, gradually restore the lid to its pristine position. The removal of the thickened and indurated palpebral conjunctiva, in the form of an elliptical fold, sometimes greatly facilitates the cure. When the affection has been caused by a vicious cicatrice, an extensive dissection may be necessary to effect the object, and even then success is by no means always certain, owing to the remarkable reproductive tendency of the inodular tissue. I have, however, repeatedly effected excellent cures by this procedure, in apparently the most unpromising cases. The operation consists in dissecting up the lid freely from its unnatural attachments, placing a well-oiled compress upon the raw surface, and making the part heal by granulation, elevation of the lid being assisted by adhesive plaster, or a thread passed through its edge, and secured to the forehead or cheek, according to the site of operation. If the lid is very large and ill-shaped, it may be necessary to cut out a triangular flap, fig. 188, and a very good cure is sometimes effected, in the more common cases of ectropion, simply by this means.

Fig. 188.

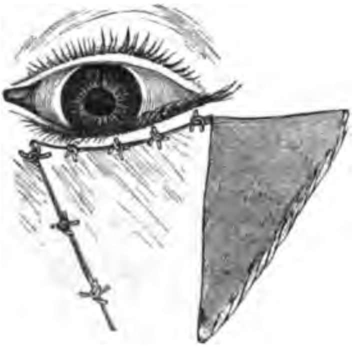


Operation for ectropion.

When the parts are much disfigured, or partially lost, whether by accident or disease, we may attempt the formation of a new lid, although we cannot flatter ourselves that our efforts will often succeed, especially if serious injury has been sustained by the tarsal cartilage, as in that event it will hardly be possible to obtain a good support for the new organ. The flap may be borrowed from the cheek or temple, or partly from the one and partly from the other. The adjoining cut, fig. 189, affords a good idea of the nature of the operation.

9. The lids are sometimes attached by morbid *adhesions* to the ball of the eye, thus not only impeding its movements, but occasioning serious deformity. The most common causes of the occurrence are scalds and burns, and the contact of escharotic substances, as nitric acid and quicklime. The defect is sometimes congenital, though this must be extremely rare, as I have never seen an instance. Relief is attempted by the cautious use of the knife, the contiguous surfaces being afterwards kept apart by soft lint, and by the daily destruction of the new adhesions with the probe. The cure will necessarily be tedious, and require the exercise of a great deal of patience.

Fig. 189.



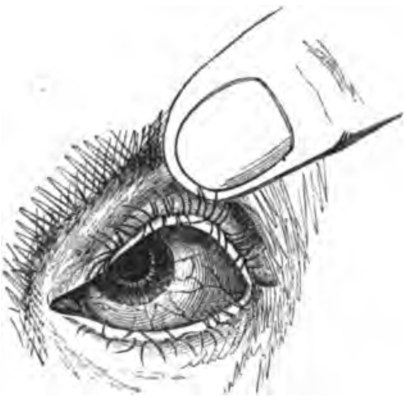
Plastic operation on the eyelid.

Dr. Hays recently published the particulars of several cases in which, after a thorough separation of the parts, he succeeded in effecting a good cure by the interposition of a thin silver plate, or a piece of thin tin-foil, shaped somewhat like an artificial eye, the lids being kept in close contact with the ball by means of strips of isinglass plaster. The foreign body is removed daily, the parts being well syringed before it is reinserted. The cicatrization is usually completed in from three to four weeks.

10. Inversion of the eyelashes, technically called *trichiasis*, represented in fig. 190, may exist as an independent affection, or as a complication of entropion. Generally caused by chronic disease of the lids, especially psoriasis and eczema, it sometimes comes on without any assignable cause, and at a period of life so early as almost to induce the belief that it may occasionally be congenital. In some persons the cilia are naturally very short, stiff and straggling, and the slightest inversion of the edges of the lids may produce quite a severe trichiasis. The lashes are generally bent in different ways, some towards the eye, some outwards, and some in the direction of the length of the lids. The constant rubbing of the faulty cilia against the ball keeps up serious disease,

and often leads to opacity of the cornea, not unfrequently followed by total blindness.

Fig. 190.



Trichiasis.

Trichiasis, dependent upon entropion, will generally disappear the moment the lid is put in a condition to resume its proper position. When the cilia alone are inverted, the only feasible remedy is excision of the part of the lid in which they are implanted, care being taken not to injure the palpebral cartilage; the little wound will soon heal, and no deformity will ensue. When all the cilia are turned in, the procedure which I usually adopt is to include them in two horizontal incisions, extending the whole length of the lid, from one end to the other. Nothing short of this ever answers the purpose, nor will this suffice, unless every bulb is taken away with its corresponding hair. Save the unseemly appearance caused by the absence of the lashes, it is astonishing what little disfigurement such an operation occasions.

It has been proposed to cure this affection by inoculating the bulbs of the faulty cilia with dry tartar emetic, with a view of causing their destruction by the resulting inflammation. I must confess I have an aversion to such a procedure. Evulsion, or drawing out the cilia by their roots with a pair of forceps, is equally objectionable; first, because the process is one of difficulty, and, secondly, because it rarely succeeds.

11. The *edges* of the lids are liable to an eruptive disease, which is often a source of much suffering, and the characteristic symptom of which is a distressing itching; it is evidently a species of herpes, or eczema, seated in the orifices of the Meibomian glands, and is generally known by the name of *psorophthalmia*, bestowed upon it by some German author. The affection is almost peculiar to young subjects, of a strumous predisposition, with light hair, eyes, and complexion. When it becomes chronic, as it is wont to do, it is a source of much annoyance, if not positive suffering, keeping the parts constantly sore, itchy, watery, and irritable. Persons thus affected are often unable to read or sew for months and years together. The disease is aggravated by exposure to the light, the use of stimulating food, loss of sleep, and, in short, whatever has a tendency to disturb the secretions or damage the general health.

Psorophthalmia is characterized by a reddish appearance of the edges of the lids, by more or less itching, and by the presence of little bran-like scales at the roots of the cilia, accompanied by an inspissated, glutinous secretion of the Meibomian follicles, lachrymation, epiphora, injection of the conjunctiva, and intolerance of light. In the milder forms of the disease, some of these symptoms are either wanting, or they exist only in a slight degree, or they are altogether absent at one time, and present at another. In chronic cases, the edges of the lids, losing their angular shape, are gradually rounded off, and assume a rough, villous, or granular appearance; the mucous membrane is abnormally thickened, the orifices of the lachrymal canals are closed, and many of the lashes drop out from the destruction of their bulbs. In this stage of the complaint, the affected lid is often considerably everted, and being at the same time very red and watery, it produces that peculiar state, termed *blear eye*.

As this disease is essentially of a constitutional origin, it would be folly to attempt its subdual by mere topical treatment. Without entering into minutiæ, it will be sufficient to remark that a steady and persistent course of purgatives, alterants, and dieting is indispensable, in almost every case, to a satisfactory and permanent cure. Blue mass and compound extract of colocynth, in five grain doses each, every fourth or fifth night, will act sufficiently upon the bowels and secretions, without weakening the system; iodide of iron and iodide of potassium will afford a good alterative effect; and bread, vegetables, and milk, will be a suitable diet. When a tonic is required, great confidence may be placed in the efficacy of iron and quinine, with a very minute quantity of opium and tartar emetic, with a view to their soothing and alterant effects. Occasionally, a brisk emetic is serviceable, especially when there is marked disorder of the digestive organs.

The most valuable topical remedies are astringent lotions and stimulating unguents, properly diluted and applied by means of a camel-hair pencil. The article which has always been most beneficial in my hands is the ointment of the oxide of zinc, in the proportion of two parts to six of prepared lard. The ointments of red oxide of mercury, of the nitrate of silver, and of acetate of lead, are also valuable agents. Sometimes the happiest effects follow the application of a weak solution of the nitrate of silver. The great secret, in the use of any article, is to make it sufficiently weak to prevent incited action, to apply it not oftener than once, or, at most, twice, in the twenty-four hours, and to bring it fairly in contact with every portion of the diseased surface. To accomplish the latter object, we should take care previously to remove, by means of a needle, the scaly deposits at the roots of the cilia, as well as any other matter that may have a tendency to interfere with the action of the remedy. When the lids are very red and tender, poppy fomentations, or an elm poultice, may be necessary. Agglutination of the edges of the lids is prevented by the application of a little thick cream at bedtime. In obstinate cases, counter-irritation may be proper.

12. *Lice*, generally of the family of body lice, occasionally lodge at the roots of the cilia, where they excite much irritation and itching. Their ova are deposited on the lashes like beads on a thread, and a great deal of care is often required to distinguish them from the little furfuraceous scales attendant upon psorophthalmia. The most efficient remedy is mild mercurial ointment.

PTOSIS.

The term ptosis implies an inability to raise the upper lid, owing to some defect in the elevator muscle. This defect may consist in mere atony of the muscle, in paralysis, in mechanical injury, or in hypertrophy of the common integuments. Occasionally it is found to exist as a congenital vice; and in several instances of this kind I have seen it associated with divergent strabismus and permanent dilatation of the pupil. It is seldom met with simultaneously on both sides. Ptosis varies in degree from the slightest drooping of the lid to its complete closure, and always produces a corresponding defect in the sight, in consequence of the manner in which the affected structures conceal the cornea and pupil.

The *treatment* of this affection must be regulated by the nature of the exciting cause. When it is dependent upon mere weakness of the elevator muscle, the most appropriate remedies will be tonics, as iron and quinine, the shower-bath, stimulating embrocations, and electricity, with change of air.

In the paralytic form, the disease often disappears spontaneously, subsiding with the cause which gave rise to it. In plethoric subjects, general and local depletion, with an occasional purgative, is sometimes necessary, in addition to the use of a small blister to the forehead and eyebrow, the surface being kept raw by means of some irritating unguent. In a case of this variety of ptosis, in a young man of twenty, under my care some years ago, I derived signal benefit, as I supposed, from the repeated application of the moxa, and powerful vesication of the occipito-cervical region. When the affection is dependent upon lesion of the brain, no treatment, however skilfully directed, will be of any avail.

Ptosis from hypertrophy is relieved by the excision of a portion of the redundant integument, in the form of an ellipsis, the edges of the wound being afterwards approximated by several points of suture. The operation is performed in the same manner as in entropion, and great judgment is generally required to determine the amount of substance to be removed.

In the traumatic form, the difficulty depends upon the division of the fibres of the elevator muscle, and their consequent separation from each other, as happens, for instance, after the operation for strabismus. To afford relief, it has been proposed to cut out an elliptical portion of the integuments of the lid, and to tack together the orbicular and occipito-frontal muscles, so as to enable the latter, by the hold thus acquired, to counteract, in some degree, the action of the former. The procedure has been employed with marked success in several instances, and is worthy of further trial, though it cannot always be expected to answer the purpose as fully as could be desired. A similar plan may be adopted in the congenital variety of ptosis.

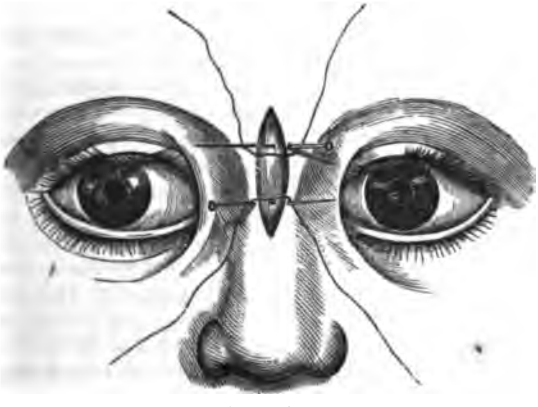
When the affection is irremediable, or while the proper remedies are being used for its cure, temporary relief from obstruction to vision may be afforded by holding the affected lid out of the way with a piece of adhesive plaster, or by means of a small blunt hook, attached to a pair of spectacles.

EPICANTHUS.

A very unseemly expression is sometimes, imparted to the eyes by the projection over them of a redundant portion of integument at the root of the nose, concealing the lachrymal caruncle and the inner part of the globe. It is always congenital, and occasionally exists in such a degree as to interfere materially with the opening of the lids, if not also with vision. Sichel and others have seen cases in which it was hereditary.

The treatment of epicanthus is entirely limited to the excision of the central portion of the redundant integument, in the form of an elliptical flap, the edges of the wound being afterwards approximated by the twisted suture. The result, however, is seldom satisfactory, owing to the tendency of the skin to stretch and elongate itself. In a case which I had at the Clinic of the Jefferson Medical College in 1858, in a girl seven years of age, little, if any, permanent benefit accrued, notwithstanding the removal of a very large flap. The character of the operation and the appearance of the affection are depicted in fig. 191.

Fig. 191.



Epicanthus.

STRABISMUS.

Strabismus, or squint, as it is termed in common parlance, is an aberration of the optic axes from their natural direction, by which the consent between the eyes is destroyed, and vision is more or less impaired. The deformity varies in different cases, from the slightest deviation to the most disagreeable obliquity. The affected organ may be turned inwards, outwards, upwards, or downwards, according to the muscle upon the derangement of which the squint depends. When it is inclined inwards, the complaint constitutes what is called convergent strabismus; if, on the other hand, it is directed outwards, it is said to be divergent. The upward and downward obliquities have not received any particular names.

The most common form, by far, of strabismus is the *convergent*, in which the eye is directed inwards, or inwards and upwards. The degree of obliquity may be very slight, or so great that when the person looks directly forward with the sound eye, the cornea of the other shall be almost completely buried at the inner canthus. The organ, in this variety of the complaint, often inclines a little upwards, but hardly ever downwards. Divergent strabismus is comparatively rare; and the two other forms are almost unknown as separate and independent affections.

There are few cases of strabismus in which both eyes are not implicated, though not in an equal degree. Usually one is more affected than the other; the patient, therefore, always considers the latter as his good eye, as it is the one which he habitually employs in viewing objects. It rarely happens, however, that both organs become deranged simultaneously; on the contrary, one generally squints first, and, after a while, the other, the interval between the two occurrences being probably very short.

The exciting *causes* of strabismus are various. One of the most frequent is the habit of imitation, so common among young persons. Hence, school-rooms are a fruitful source of the mischief, the affection often spreading from one "cross-eyed" child to another until, perhaps, large numbers are involved. Statistics show that nearly one-seventh of the cases are thus induced. Ophthalmia, convulsions, eruptive diseases, as measles, scarlet fever, and smallpox, hooping-cough, derangement of the digestive organs, injuries of the head and eyes, difficult dentition, and looking fixedly at particular objects, may all be mentioned as so many exciting causes of the lesion. It frequently comes on without any assignable reason in the most healthy persons. I have witnessed examples in which it was congenital, and I have repeatedly known it to exist in from three to five members of the same family. There is no evidence that the complaint is hereditary. Young subjects are most liable to it.

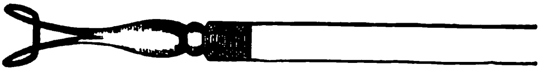
Strabismus essentially consists in a permanent contraction of one of the straight muscles of the eye. The shortening thus produced varies according to the extent of the squint, and is always accompanied by a corresponding elongation of the opposite muscle, so that it gradually loses, either wholly or in part, its antagonizing influence. The affected muscle is not only broader and thicker than the rest, but also of a deeper color; in a word, it is hypertrophied, in accordance with a law of the economy that, in proportion as an organ is exercised, so will be its size and strength. In the few dissections which I have made of persons who died while laboring under this complaint, this condition was too manifest to escape notice, and it coincides precisely with what has been observed by others in similar cases. Of the immediate cause of strabismus we are ignorant, but the probability is that it is owing to some perverted action of the nerves which supply the muscles of the eye, rather than to any actual lesion of these muscles themselves.

One of the most disagreeable *effects* of this disorder is the deformity which accompanies it, and which renders the individual an object of frequent remark and ridicule. Were this confined to infancy and childhood, no evil would flow from it; but when it is remembered that it continues through life, and that it is a source of constant annoyance and mortification, the influence which it exerts upon the temper of the sufferer must often be most unhappy. But there is another effect, still more deplorable, and this is the impairment of the vision of the affected eye. This defect, which is never entirely absent, always varies with the extent of the deformity and the length of time that has elapsed since its occurrence. In some instances, especially in those of long standing, the sight is altogether destroyed, the retina being as insensible as in amaurosis. In another series of cases, the person is myopic, or sees objects only at a short distance. In a third series, the vision is, perhaps, double, or objects appear indistinct, or run into each other, the image painted on the retina being confused and imperfect.

It is well known that strabismus has no tendency to spontaneous cure; on the contrary, it generally manifests a disposition to increase, especially in children of a nervous, excitable temperament; and the question, therefore, arises, at what period ought the surgeon to interfere? My opinion is that the operation should be performed early; but, in coming to a conclusion on the subject, we should carefully weigh the circumstances of each case, as the condition of the patient, and the nature of the exciting cause of the complaint. If the child is otherwise healthy; if there has been no cerebral disease; and if the squint is fully formed, there should be no hesitancy about a resort to the knife. There are valid reasons for such a course. In the first place, if the deformity is permitted to persist, the probability is that both eyes will ultimately require interference; secondly, so long as the squint remains the subject of it will be an object of remark and ridicule; and, thirdly, the invariable tendency of the affected organ is to become weaker and weaker, in proportion to its want of exercise. Besides, children invariably bear such operations well; they are unattended with hemorrhage and shock; and chloroform is always at hand to insure the requisite quietude during their performance.

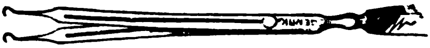
The instruments which I employ in this operation are a lid-holder, a double, sharp-pointed hook for fixing the eye, a pair of forceps for pinching up the conjunctiva, and scissors for dividing this membrane, the ocular fascia, and the affected muscle. The lid-holder, fig. 192, is about five inches and a half long, quite delicate, and curved at the extremity, which is perfectly smooth and polished, and about four lines in width. The nature of the double hook for steadying the eye may be easily understood from the annexed drawing, fig. 193.

Fig. 192.



Blunt hook.

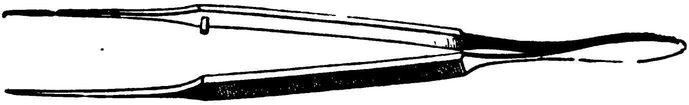
Fig. 193.



Double hook.

It is about five inches in length, and is furnished with a movable slide, so as to admit of the proper separation of the branches, each of which, being two lines in width, terminates in a short, fine prong. The forceps, fig. 194, a toothed one, should also be rather small; while the scissors should be long, slender, and narrow at the extremity. No knife is necessary.

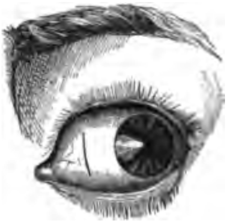
Fig. 194.



Toothed forceps.

I generally prefer to perform this operation without chloroform, as such a procedure affords a much better opportunity of judging of the effects of the division of the muscle. If the patient, however, is a child, or a very timid person, anæsthesia will be indispensable. In either event, the body should be recumbent, with the head and shoulders well supported by pillows. An assistant elevates the upper lid, as in the operation for cataract, and secures the eye with the double hook firmly implanted in the sclerotica, about the eighth of an inch behind the cornea, and precisely on a line with the horizontal axis of the organ, the blades of the instrument being separated about two lines. The lower lid may generally be readily depressed by the surgeon himself, or this may be done by another assistant with a blunt hook.

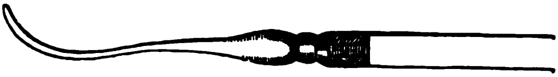
Fig. 195.



Plan of the eye, showing the line of incision in the conjunctiva.

The operator now pinches up a small fold of the conjunctiva, immediately behind the hook, and divides it perpendicularly with the scissors, fig. 195; he then cuts in the same direction the ocular fascia, or the submucous cellular substance, and, finally, the internal straight muscle, the latter being severed near its point of insertion into the sclerotic coat. The moment this is accomplished, the eye, from the traction exerted upon it by the hook, springs towards the nose, and the muscle retracts within its sheath, especially if it has been thoroughly liberated from its connections. To effect this, which is a matter of paramount importance, the scissors should be carried a considerable distance round the eye, occasionally, indeed, nearly as far as the margins of the adjacent straight muscles. The eye will now generally move about freely in its socket, in perfect harmony with its fellow. Should this, however, not be the case, a careful search should be instituted with the curved probe, fig. 196, with a view of ascertaining the cause of the difficulty, which will usually be found to be an imperfect division of the muscle, or of some of the fibrous bands extending from it to the sclerotic coat. Sometimes the obliquity continues without any assignable cause, though rarely beyond a few hours.

Fig. 196.



Curved probe.

The operation being completed, the eye is bathed in cold water, to free it of blood, and the patient is confined for a few days in a dark chamber. Light diet is enjoined, and inflammation restrained by antiphlogistics. Pain and nervous symptoms are best controlled by anodynes. Considerable ecchymosis occasionally follows the incisions, but requires no particular treatment, as it usually disappears spontaneously in a few days. Suppuration is hardly to be looked for in any case; the occurrence implies improper violence, which cannot be too much condemned. For four or five weeks after the patient leaves his room the eyes should be protected with a green shade, and he should avoid reading, writing, and, in short, every other occupation calculated to injure his sight. Premature use and exposure of the eyes cannot be too much deprecated, as they tend not only to produce inflammation, but also to jeopard the success of the operation.

Soon after the operation is over, the surface of the wound becomes coated with plastic matter, which thus lays the foundation of the granulating process by which the parts are ultimately repaired. The period required for the completion of the cicatrization varies from three to six weeks. Generally it is retarded by the formation of fungous matter, which springs up at the site of the incision, and requires to be snipped off with the scissors; a proceeding far preferable to the application of nitrate of silver, which is not only much more painful, but far less effectual. The extremity of the divided muscle contracts new adhesions to the ball of the eye, and thus aids in maintaining its parallelism after the cure is completed.

I cannot approve of the practice, recommended by some surgeons, of making the patient turn the eye outwards as soon as he has recovered from the more immediate effects of the operation, for the purpose of causing it to regain its natural position in the orbit. In my earlier cases, before I had devoted much attention to the subject, I adopted this advice, but the result uniformly disappointed me. I have, therefore, long since abandoned it, persuaded that it is founded on erroneous principles. When the eye still retains some degree of obliquity after the operation, it may positively be assumed that there has been imperfect section of the affected muscle, or of the fibrous cords connected with it. How, then, when this is the case, can we expect success? Again, the eye operated on may be perfectly straight, and yet not move in concert with its fellow. Such a result is by no means uncommon, especially in the older forms of the complaint, and hence the proper rule, in such an event, is to divide at once the corresponding muscle of the other eye. In children, and in cases generally of recent standing, one operation is usually quite sufficient, even when the obliquity remains for some time after. Indeed, the greatest caution should be employed even in the division of one muscle, lest the eye be permanently inclined outwards, and so distortion be produced in the opposite direction.

The principal causes of failure after this operation are: first, as already stated, the imperfect division of the affected muscle and fascia; secondly, excision of a portion of the conjunctiva, eventuating in undue contraction of this membrane during the process of cicatrization; thirdly, premature exercise and exposure of the eye; fourthly, the coexistence of epilepsy, hydrocephalus, and other cerebral diseases; fifthly, re-adherence of the muscle to an unfavorable point of the sclerotic coat, by which it is again enabled to exert a prejudicial influence over the movements of the ball; and, finally, the fact that only one operation is performed, when it is certain that both organs are affected nearly in an equal degree. Of all these causes the first and last are the most frequent and efficient. Very recently, I had under my care a youth on whom I operated for double strabismus, whose eyes have become slightly everted from the want of accurate union of the edges of the wound, the sclerotica exhibiting its characteristic white appearance at the bottom of the incision.

The effect of the operation upon vision is at first rather disagreeable than otherwise; at least in some cases. It is only by degrees that the eye regains its functions; and occasionally, whether from long disuse of the retina, or from other causes, little or no improvement of this kind is to be looked for. Another unpleasant effect, but not a very common one, is double vision, which is evidently due to a want of consonance between the optic axes, and rarely continues beyond a few days. Finally, we must not forget to mention the peculiar prominence of the eye after this operation. This is generally well marked in every instance, and imparts to the organ a full, bold, disagreeable expression; it is accompanied by a considerable separation of the lids, and is simply due to the liberation of the eye from its confined position.

The operation for strabismus is performed much less frequently now than formerly; chiefly because it has fallen somewhat into discredit from the numerous failures that have attended it in the hands of incompetent men. Every physician, in fact, has considered himself qualified to undertake it, no matter how slender his anatomical knowledge and practical skill. It is not surprising, therefore, that many of the cases that have been subjected to the operation should have disappointed expectation; but these circumstances should not discourage us, or be used to the prejudice of an operation, calculated, when properly executed, to confer so much benefit upon this class of sufferers. The results that have transpired in regard to it are eminently gratifying, and are sufficient to show that the procedure deserves to be ranked among the established resources of surgery.

The *sub-conjunctival operation* for strabismus has at present very few advocates, nor is it at all likely that it will ever come into general use, owing to the great difficulty of its execution. The chief reasons urged in its behalf are that it is followed by less inflammation and less prominence of the eye, which is often so disfiguring in the ordinary procedure. Its disadvantages are that it is more troublesome, and that it requires much more care to liberate the affected muscle thoroughly from its connections with the sclerotica, thus jeoparding the result, especially in the hands of an inexperienced surgeon. As to the circumstance of its being productive of less inflammation, I consider that as a matter of very little consequence, as I have never witnessed any bad effects from the ordinary procedure. The operation may be performed with the scissors, or a probe-pointed bistoury, introduced through a small opening in the conjunctiva, and carefully insinuated beneath the affected muscle. Dr. Addinell Hewson employs a pair of curved scissors, furnished with a sliding blade, terminating in a sharp point. The blunt blade being passed beneath the muscle, the other is pushed on over its outer surface, when its division is effected simply by closing the instrument. A preliminary incision, horizontal, and a quarter of an inch in length, is made just below the inferior border of the muscle.

AFFECTIONS OF THE ORBIT.

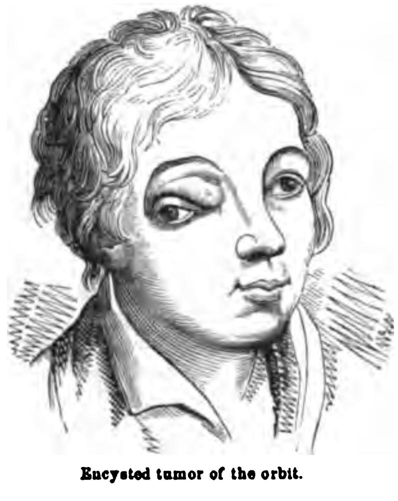
The orbit is subject to various affections, seated either in its bony walls, or in its soft textures. These affections, however, do not differ materially, if at all, from similar lesions in other parts of the body. One of their most disagreeable effects is that which arises from the pressure which they exert upon the ball of the eye, thereby thrusting it out of its natural position, and at the same time endangering its structure and functions.

Caries and necrosis of the walls of the orbit are observed chiefly in tertiary syphilis; I have met with quite a number of such cases, and have invariably found them troublesome and tedious. When the margin of the orbit is involved, serious deformity of the lid will generally be the consequence.

Abscess of the orbit is uncommon. It may arise from disease of the bone, or as a consequence of erysipelatous inflammation of the cellulo-adipose substance. The symptoms are of the phlegmonous kind, and relief must be afforded by early evacuation.

Intra-orbital *tumors* are of two kinds, the solid and the encysted, the former being either of a fatty, fibrous, osseous, or encephaloid character. Their development generally begins deep in the socket, and instances occur, though rarely, in which they take their rise at the base of the brain, from which they gradually proceed through the openings in the sphenoid bone. However this may be, they sooner or later seriously encroach upon the ball of the eye, displacing it in different directions, and ultimately pushing it completely out of its socket. The morbid growth is commonly very tardy, except when it is of a malignant nature, when it advances with its usual rapidity. The amount of suffering attending it is variable, being sometimes extremely severe, while at other times it is remarkably slight. As the tumor increases in bulk, the eyelids are thrust apart, and rendered tumid and œdematous, the cheek swells, and the patient is distracted with circumorbital pain. In some cases the ball of the eye is merely pressed to one side by the new growth, their position being defined by a distinct line of demarcation; in general, however, they are more or less intimately blended together, especially at the optic nerve, which is not un-

Fig. 197.



Encysted tumor of the orbit.

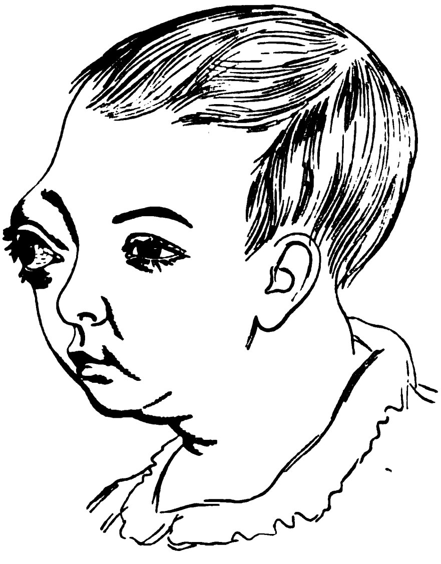
frequently completely surrounded by the new structure, thus rendering it extremely difficult, if not impossible, to separate them from each other.

The *encysted tumor* of the orbit, fig. 197, from Mackenzie, generally contains a clear, limpid fluid, of a sero-albuminous character; sometimes, however, the contents are more or less turbid, or partly solid and partly fluid. A very curious case of encysted tumor of the orbit, in a lad aged seventeen, has been recorded, in which there was an imperfectly developed tooth; and Sir Everard Home met with an instance in which a cavity of this kind was filled with an inflammable oily fluid. The cyst, although usually single, is occasionally multilocular, and of extraordinary thickness and density.

Acephalocysts and echinococci have been observed in the orbit, but their occurrence is extremely rare, and their detection must necessarily be purely accidental.

The orbit is occasionally the seat of the *arterial tumor*, the anastomotic aneurism first described by John Bell; it is generally a congenital affection, and is capable of acquiring a great bulk, forming a characteristic pulsating growth. The annexed sketch, fig. 198, from Walton, affords a good idea of this disease, and of the influence it may exert upon the ball of the eye. The venous tumor is also occasionally met with, but its occurrence is uncommon. The ophthalmic artery is sometimes the seat of aneurism. Mr. Ernest Hart, in 1863, reported a unique case of traumatic arterio-venous aneurism of the frontal branch of this vessel, in a boy, eleven years of age. The tumor, situated at the inner angle of the orbit, just below the margin of the bone, pulsated strongly, and was attended with a perceptible thrill and a loud, whizzing bruit.

Fig. 198.

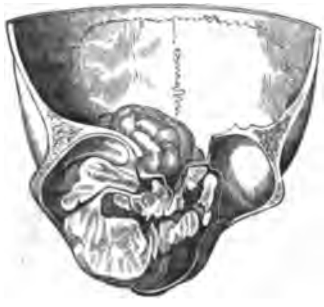


Anastomotic aneurism of the orbit.

The *bones* of the orbit are subject to hypertrophy, chiefly as the result of a syphilitic taint of the system; the disease usually occurs in union with hypertrophy of the cranial bones, and may exist in such a degree as to encroach very seriously upon the ball of the eye.

Exostosis of the orbit is extremely uncommon. It may spring from any portion of the cavity, and is precisely of the same structure as an exostosis in other parts of the body. As it increases in size, it causes more or less pain by its pressure upon the surrounding tissues, and gradually but effectually displaces the eye, pushing it sometimes completely out of its socket. Amaurosis and total blindness are occasionally among the first symptoms of the disease. The growth not unfrequently begins very early in life. The diagnosis is generally easily determined by the history of the case, and by the remarkable firmness of the tumor, which is greater than that of any other morbid structure. The adjoining sketch, fig. 199, represents an ivory exostosis springing from the anterior part of the cranium, and filling the left orbit.

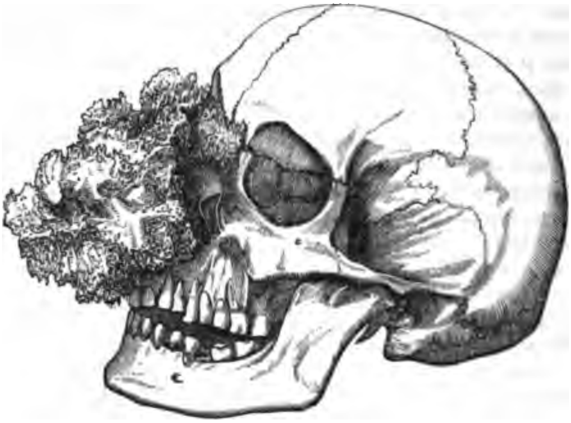
Fig. 199.



Ivory exostosis of the left orbit.

An exostosis occasionally originates in the maxillary sinus, and, passing upwards into the orbit, completely distends it, at the same time that it forms a large tumor upon the face. In the case from which the annexed drawing, fig. 200, was taken, the growth was probably of a malignant nature, as it had destroyed not only the orbit but also the malar, maxillary, and frontal bones. The osseous part which remained after maceration consisted of an oval mass of a light porous character, five inches in diameter by four inches in length. Mr. Walton, by whom this tumor has been described, is of opinion that it might have been safely extirpated even in its latest stages, and with great ease and success at an early period. It had been five years in progress before it proved fatal.

Fig. 200.



Encephaloid of the orbit and antrum.

A very remarkable case of *neuromatous tumor* of the optic nerve, causing great protrusion of the ball of the eye, has been described by Dr. J. A. Lidell, of Washington, in a woman, aged twenty years, for the last eight of which she had labored under the disease. The tumor, divested of extraneous matter, was fully as large as a goose egg, of an elongated, oval shape, and of a laminated fibrous structure. It was formed by the expanded and thickened sheath of the optic nerve, and was invested by a smooth, glossy capsule of condensed cellular substance. Two cysts, filled with reddish serum, were attached to its superior surface, and imparted a sense of fluctuation to the upper eyelid. Excessive pain, of a neuralgic character, attended the case, and the symptoms closely resembled those of carcinoma. The operation was accompanied by copious hemorrhage. The woman was in good health five years afterwards.

The various forms of orbital tumors are often difficult of *diagnosis*. The points which should more especially claim attention with a view to an accurate discrimination are the history of the case, the consistence and progress of the morbid growth, and the presence or absence of pulsation. The solid growth may, in general, be easily distinguished by its firmness, the fluid by its softness. The fatty tumor has a doughy feel; the fibrous an elastic one. An exostosis is always remarkable for its extreme hardness. The encysted tumor of the orbit is not only soft, but distinctly fluctuates under pressure. The hydatic tumor possesses similar properties, but cannot be distinguished from the encysted, properly so called. An aneurism by anastomosis is characterized by strong pulsation, by a peculiar thrill synchronous with the contraction of the left ventricle, and by the atrocious pains which it produces in the eye, head, and face. The innocuous tumor is generally tardy in its development; the malignant rapid, with a tendency to early ulceration and adjacent implication. In all cases of doubt, recourse should be had to the judicious use of the exploring needle, the instrument selected being of the smallest size.

In the examination of supposed orbital growths the surgeon should not forget that great protrusion of the eye may be caused simply by an anemic condition of the system, by inordinate deposits of fat, and by an infiltration of the orbital cellular tissue consequent upon inflammation and external injury.

The *treatment* of these various formations must be conducted upon general principles, or according to the rules laid down for their management in different parts of the work. Unless there is reason to believe that they may be removed without any material detriment to the eye, the best plan will be not to meddle with them, unless it is previously understood that this organ is to be sacrificed if it is found to be seriously involved in the morbid structure. This should not, of course, be thought of so long as the abnormal growth is comparatively small, does not encroach obstructingly upon vision, or occasion severe suffering. The situation, shape, and extent of the incisions must be regulated according to the exigencies of each particular case. When the tumor occupies the outer or inner canthus of the eye, the object may generally be attained by slitting up the lids in the direction of their commissures, otherwise it will probably be necessary to cut through their substance. In the solid tumor complete riddance should always be aimed at.

The encysted tumor may be removed entire, or, if its connections are intricate, a portion of the cyst may be left, the secreting surface being destroyed with nitrate of silver or tincture of iodine.

For the cure of intra-orbital aneurism the common carotid artery has occasionally been tied. Of 20 cases of this operation tabulated by Mr. Ernest Hart, 14 were successful, 3 terminated fatally, in 2 the result was incomplete, and in 1 the pulsation of the tumor continued unabated. One of the cases was a traumatic arterio-venous aneurism.

Occasionally a cure has been effected by injections with perchloride of iron; and within the last few years Gioppi and Vansetti, of Padua, have each treated a case successfully by digital compression of the common carotid. The tumor in these instances was of a formidable size; the eye protruded from its socket; the bruit was heard very loudly; and the pulsation could easily be felt by the finger inserted into the orbit. The compression was maintained intermittently for a few minutes at a time. In Gioppi's case all pulsation ceased at the end of the fourth day; in Vansetti's, in about two weeks and a half. Direct interference could only be justifiable in the earlier stages of the disease, before the morbid growth has acquired any considerable bulk.

In a case of this disease, recently reported by Dr. E. L. Holmes, of Chicago, a cure seems to have been effected by the conjoined use of tincture of veratrum viride and Tilden's fluid extract of ergot, administered during a period of about six weeks in such a manner as to keep up a constant and decided impression upon the heart's action.

An exostosis of the orbit has occasionally separated spontaneously, as in a remarkable case recorded in the first volume of Guy's Hospital Reports. The growth, situated at the inner part of the orbit, weighed nearly fifteen ounces. When excision is carefully performed, the patient may not only regain his sight when this has been impaired, but the eye may ultimately return to its natural position, and recover its accustomed freedom of motion. Hypertrophy of the bones is generally irremediable.

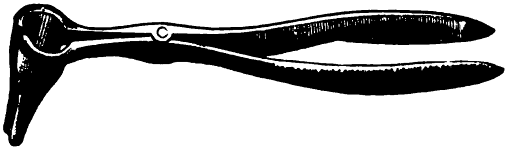
CHAPTER VI.

DISEASES AND INJURIES OF THE EAR.

Before I proceed to describe the diseases of the ear, it will be necessary to offer some remarks upon the proper mode of examining it, with a view to the detection and discrimination of its healthy and morbid conditions; for upon the care with which this is conducted, and the results thereby obtained, must, in great degree, depend the success of our therapeutic measures.

It is hardly necessary to say that such an exploration cannot be made without a good light. The best is that afforded by the direct rays of the sun, but in cloudy weather an artificial illumination will be required. The patient being seated upon a chair, with the ear inclined towards the opposite side, facing the sun, the light should be permitted to fall directly upon the tympanal membrane, as can easily be done by pulling the auricle upwards and backwards with the thumb and forefinger of one hand, while the tragus is drawn forwards with the index finger of the other. If the sun is very bright, the examination may be conducted in a room, in front of a large window, but even then I generally prefer making it in the open air, from the fact that transmitted light is never as satisfactory as direct. The surgeon must be careful not to obstruct the passage of the sun's rays with his own head, and he should also see that no one else interferes, as two persons can never inspect the organ at the same time. A speculum need be used only when the auditory passage is unusually narrow or studded with an uncommonly large number of hairs obstructing vision. The one which I prefer, and which will generally be found to answer every purpose for which such an instrument can be employed, is presented in fig. 201. It is very light and convenient, and may be adapted to almost any ear, however small, as its terminal extremity is not more than two lines in diameter, while its movable blades readily admit of this distance being increased to any extent compatible with the size of the canal. The speculum invented by Mr. Wilde, and delineated in fig. 202, is also an excellent instrument, although I cannot perceive that it possesses any advantages over the other except its more easy portability. The same remark is true of Mr. Toynbee's speculum, shown in fig. 203. The fact is that these things are very much a matter of conceit or fancy, influenced often by prejudice rather than sound judgment, or the result of correct observation. Be this as it may, I am certain, from much observation, that the eye alone will, in general, be quite sufficient for any examination we may be called upon to make. There are cases, indeed, where the auditory canal is so sensitive as absolutely to prevent the introduction of the speculum, however gently effected.

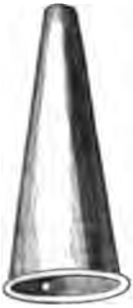
Fig. 201.



Ear speculum.

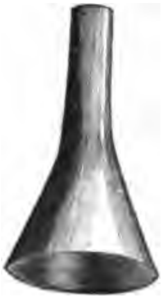
In cloudy weather or at night, the examination may easily be effected with the aid of a Miller's lamp, fig. 204, consisting of a reflector and a wax candle, inclosed in a Palmer's spring tube, six inches in length, and resting upon a base two inches and a half in diameter. The top is closed with a cap. A speculum having been inserted into the ear, the light is thrown upon it by means of the lamp, the whole proceeding being conducted as represented in fig. 205, from Toynbee.

Fig. 202.



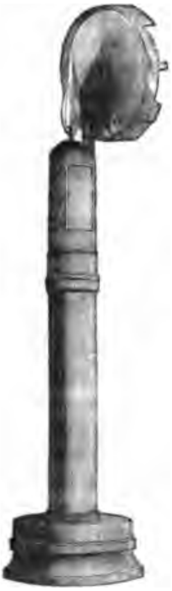
Wilde's speculum.

Fig. 203.



Toynbee's speculum.

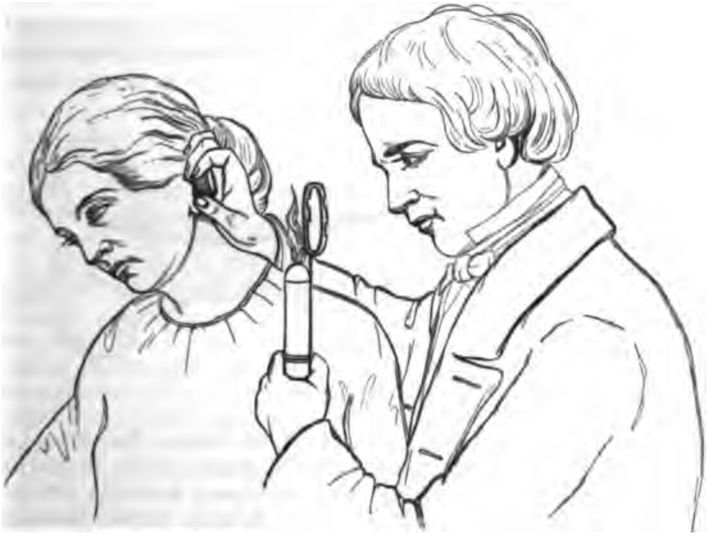
Fig. 204.



Miller's lamp.

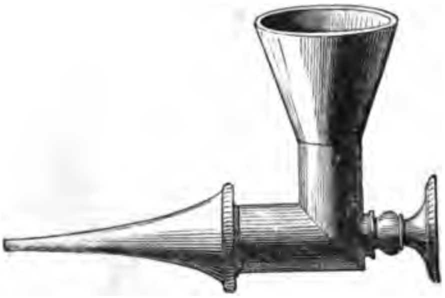
A very light, cheap, and convenient instrument for examining the ear, both with solar and artificial light, has been invented by Dr. Grant, of New Jersey. It consists, as seen in fig. 206, of a concavo-convex funnel, in which the rays are collected and thrown upon a highly polished steel mirror placed at an angle of 45°. Passing directly through this mirror is a straight tube, which is armed with a powerful lens, and which can be adjusted by means of a screw to any focus. Both the funnel and tube are coated with silver, feebly polished. From this mirror the

Fig. 205.



Inspection of the external meatus by means of Miller's lamp and the tubular speculum.

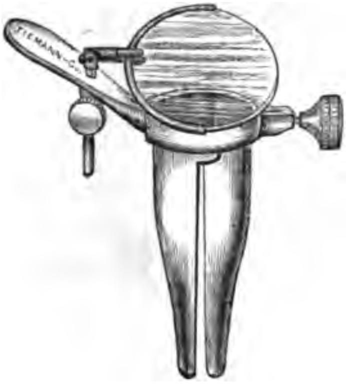
Fig. 206.



Dr. Grant's aural reflector.

rays of light are thrown, at a right angle, directly upon the tympanic membrane, which, together with the adjacent parts, is thus fully illuminated, the instrument having previously been adjusted in the external ear.

Fig. 207.

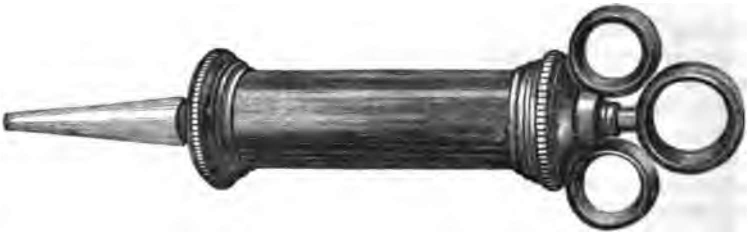


Weber's speculum.

Perhaps the most simple and efficient of all these various contrivances for inspecting the ear is that sketched in fig. 207, devised by Weber, of Berlin, and modified by Simrock, of New York. It is simply a bivalve speculum, with a magnifying glass, throwing the light into the meatus and thus increasing the size of the tympanum.

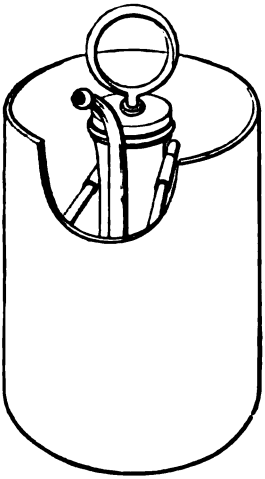
While the light is thus playing about in the passage, the examiner takes a rapid survey of the appearances of the parts, noticing particularly the condition of the membrane of the tympanum, as to whether it is transparent or opaque, red, injected, convex or concave, ulcerated, perforated, or destroyed; also the state of the auditory tube, the color and quantity of the cerumen, and, in short, everything else calculated to furnish matter of diagnostic and practical value. Should the parts be obscured, or concealed from view, by the presence of pus, wax, epithelium, or hair, clearance must be effected, as a preliminary step, by syringing the tube with tepid water. A very suitable instrument for this purpose is that depicted in fig. 208. It must be capable of holding at least from two and a half to three ounces of fluid, which should be thrown up with some degree of force, yet at the same time so cautiously as not to shock or pain the affected structures. It should be held firmly in the hand, with the nozzle, which should be inserted only a few lines, directed obliquely downwards and forwards, the water, as it regurgitates from the tube, being received into a large, flattish basin, held under the patient's ear and chin. A convenient contrivance, combining the arrangement of a basin and syringe, for injecting the ear, was devised by Dr. Hullihen, of Wheeling, and is represented in fig. 209. Mr. Toynbee employs what he calls an ear-spout, fig. 210, a kind of tin gutter, fitted closely to the head, under the ear, by means of a spring. The use of the probe is not admissible in these examinations. The forceps or scoop may occasionally be employed in the removal of solid matter.

Fig. 208.



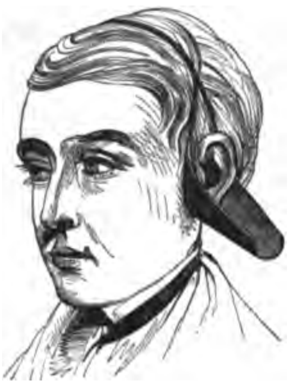
Ear syringe.

Fig. 209.



Hallibon's apparatus.

Fig. 210.



Ear-spout fitted on the head.

The manner of exploring the Eustachian tube will be described along with the diseases of that passage. A watch held near the ear will determine, by its ticking, perceived by the patient, the degree of hearing. The experiment should be repeated at each visit, and the result carefully noted, as it affords important information relative to the progress of the treatment.

Finally, to render such an examination complete, we must carefully inspect the patient's throat and tonsils, take particular notice of the state of his voice, percuss the mastoid region, and auscultate the ear while air is being forced into it along the Eustachian tube.

SECT. I.—AFFECTIONS OF THE EXTERNAL EAR.

The auricle is liable to various *malformations*, of interest both in a pathological and surgical point of view. In the first place, it may be entirely absent, either on one or both sides, without any vestige whatever of an external opening. Such a case is not necessarily attended with deafness, although audition must be much impaired. Secondly, there is occasionally an absence of the lobule of the ear; or this structure is divided, by a vertical fissure, into two portions, an anterior and a posterior; or, lastly, it is attached to the side of the head, either partially or completely. Thirdly, there may be a deficiency of the helix, this body being either wanting, or so small and flat as hardly to deserve to be considered as a distinct process. This defect is sometimes congenital, but is much oftener produced, there is reason to believe, by the pressure of the hat in early life. Fourthly, the tragus and anti-tragus are occasionally bilobed, or divided each into two portions; sometimes they are inverted towards the meatus, thereby partially closing it; and sometimes, again, they are more or less extensively united, particularly along their lower borders, producing a similar effect. Finally, excessive development of the ear may be enumerated as one of its malformations.

In 1860, I had a case at the clinic of the Jefferson Medical College, in an infant three months old, of supernumerary ears, in a very rudimentary state, situated immediately in front of the tragus, over the temporo-maxillary joint. In some instances the additional organs occupy the side of the neck.

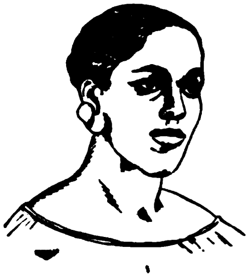
Some of the above defects admit of remedy by surgical operation; others do not. Thus, a cleft lobule might readily be united by a procedure similar to that for hare-lip; an inverted tragus might be retrenched or excised; and an abnormal adhesion might be severed by a simple dissection, care being taken, during the healing process, to keep a piece of lint interposed between the raw surfaces. In the case of supernumerary ear, above referred to, no difficulty was experienced in effecting thorough excision.

Wounds of the external ear are treated upon general principles. The parts being properly cleansed, the edges are closely approximated with a needle and fine thread, aided, if necessary, by a few strips of isinglass plaster, which answers much better here than ordinary adhesive plaster.

Should a bandage be necessary, it must be applied with great care and gentleness, and with the precaution of filling up the hollow between the ear and head with cotton, wool, or lint.

The lobe of the ear is occasionally the seat of a *fibrous tumor*, a variety of keloid. I have seen five cases of it, all in colored females, in consequence of the perforation of this body, and the wearing of a ring. The youngest of these persons was a child, three years old, who had been subjected to the operation about eighteen months previously. My experience is that the growth is much more common in blacks than in whites, and I believe that the exciting cause is nearly always the one here referred to. The tumor is pendulous, of tardy development, insensible, hard, and inelastic, without malignancy, although prone to recur after removal, and free from discoloration of the skin, which also retains its normal thickness and pliancy. It is generally somewhat rounded or ovoidal in its shape, and is capable of acquiring a volume equal to that of a hen's egg. In some instances it is lobulated. It is of a fibrous structure, whitish in color, and of a dense, almost uniform consistence. A good idea of this variety of tumor is afforded by fig. 211, from one of my clinical cases. The patient was a negress, twenty years of age. The lobe had been perforated early in life, and the growth had been in progress for upwards of ten years. The remedy is excision, care being taken to save as much integument as possible, in order to prevent deformity. The edges of the wound are carefully approximated by the twisted suture.

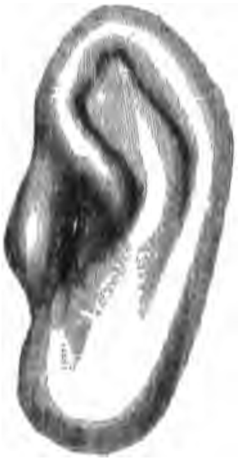
Fig. 211.



Keloid tumor of the ear.

Great *deformity* of the ear, with extraordinary induration, is sometimes met with, chiefly in elderly females, in consequence of repeated attacks of erysipelas. The immediate cause of the affection seems to be the retention and organization of the plastic matter that is poured out during the progress of the disease. The result is that the auricle is rendered hard, lumpy, and inflexible, so as to resemble a piece of thick, wet sole leather; it is somewhat shortened in the antero-posterior diameter, and the meatus is so much encroached upon as to look like a mere slit. The skin is of a dusky brownish color, and the seat of more or less itching. The disease, which is generally tedious and troublesome, requires a mild course of alteratives, the best local application being zinc, copper, and tutty ointment. In obstinate cases gentle ptyalism may be necessary. The annexed cut, fig. 212, from Wilde, affords a good illustration of the nature of this affection.

Fig. 212.



Deformity and induration of the ear from chronic erysipelas.

A very unseemly fissure is sometimes found in the lobe of the ear, in consequence of the accidental tearing out of the ear-ring. The mishap is usually caused by the infant as it lies at the breast, watching the ornament. I have several times met with it on both sides. The treatment consists in refreshing the edges of the cleft, and in approximating them by suture.

White, *chalky* or plaster-like concretions, occupying the lobe of the ear, within the helix, are occasionally met with, as the result of a gouty diathesis. They present themselves in small round prominences immediately beneath the skin, and are composed of the same material as articular tophi, uric acid crystals, very delicate, needle-shaped, and of all possible sizes, forming conspicuous ingredients. Left to themselves, these concretions are sometimes eliminated spontaneously, a slight scar marking their exit. When they are productive of pain and irritation, they may be liberated by a small incision, aided by pressure.

SECT. II.—AFFECTIONS OF THE AUDITORY TUBE.

The auditory tube is liable to malformations, the introduction of foreign bodies, accumulations of wax, polypous growths, and various forms of inflammation.

a. MALFORMATIONS.

The most common malformation of this passage is occlusion of its external orifice by an extension of the common integuments, producing a condition similar to that which we occasionally see in the anus, vagina, and other mucous outlets. A person thus affected is not always deaf, although his hearing must of necessity be very defective. The cutaneous cover may be very thin, consisting, perhaps, merely of a sort of translucent layer, but, in general, it is quite thick and opaque; it may be the only aberration, or it may be associated with absence of the auricle. Such a malformation obviously admits of easy relief. All that is necessary is to make a crucial incision in the situation of the natural orifice, to remove the angles of the wound, and to prevent reunion by the interposition of tents of gradually increasing sizes. But there is another case where relief is either impracticable, or where patency can be established only after much trouble and delay. This is where the occlusion is effected by fibrous, or fibro-cartilaginous matter, extending some distance down the passage, but not completely obliterating it. Here, only the most cautious and patient attention will be likely to be of any avail. The dissection is made in the direction of the tube, the ear being drawn upwards and backwards during the operation. Reunion is prevented by the steady and protracted use of tents. Of course no operation is attempted when the tube is entirely impervious, or, more properly speaking, when none whatever exists. The use of a delicate exploring needle will be of great assistance in the investigation of these various conditions of the ear.

Finally, children are occasionally born with the ears completely filled with the unctuous matter which covers the skin, and which is probably derived either from the sebaceous follicles, as a depurative secretion, or from the amniotic fluid. However this may be, if the matter is allowed to remain, the deafness, which was at first, perhaps, only partial, may, in time, become complete; or the adventitious substance, acting as a foreign body, may excite inflammation, and ultimately lead to destruction of the tympanal membrane. Clearance is effected by means of the syringe and tepid water, aided, if necessary, by the scoop. A few drops of oil, or glycerin, poured upon the mass, might assist in detaching it.

b. FOREIGN BODIES.

Substances of various kinds find their way into the auditory tube, either by accident or design. The most common are grains of corn and coffee, beans, peas, cherry-stones, beads, pebbles, and pellets of paper, wool, cotton, bugs, and flies. Insects sometimes deposit their larvæ in the ear, being evidently attracted thither by purulent discharges, which, if at all abundant, may afterwards serve as a nidus for the development of the new being. It is surprising that pins, which are so frequently used by females for picking and scratching the ear, do not more frequently drop into the tube than they seem to do.

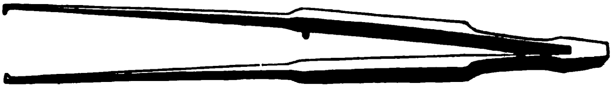
The effects occasioned by the presence of a foreign body in the ear vary according to its nature, size, and shape. If it be a grain of corn, bean, or similar substance, it will, if retained for a few days, not only expand under the influence of the moisture of the part, but, perhaps, even germinate, thereby causing severe pressure upon the parts in which it is impacted, and increased difficulty in respect to its extraction. No such effect, of course, will follow if the body is of an inorganic nature. Nevertheless, any substance, whatever may be its character, may, by its pressure alone, induce severe pain and inflammation, eventuating in an abundant discharge of matter, excessive constitutional irritation, headache, and delirium. A large substance will, as a general rule, cause more trouble than a small one, a rough than a smooth, a heavy than a light, a sharp than a blunt. A foreign body may excite ulceration of the membrane of the tympanum, and thus finally find its way into the middle ear. Such an occurrence, which is fortunately rare, is sure to be followed by severe suffering, if not death.

In gunshot injuries, the ball sometimes lodges in this tube, or in this tube and the petrous portion of the temporal bone. Dr. F. F. Maury showed me a case last summer in which a body of this kind had been impacted upwards of a year, in the right ear of a young man who was shot at the battle of Chancellorville in 1863, without causing any other inconvenience than slight deafness, and occasional dizziness. The ball had entered through the zygomatic fossa, and could easily be felt with the probe. Cases are recorded where violent neuralgia, paralysis, epilepsy, and even mania were induced by the protracted sojourn of an extraneous substance in the ear. On the other hand, a foreign body will occasionally remain in the auditory tube for a long time without occasioning the slightest mischief. Not long ago, a girl, aged eleven, was brought to my clinic at the Jefferson Medical College with a large cherry-stone in the right ear, in which it had been harmlessly impacted for seven years.

The removal of a foreign body from the ear is by no means always an easy undertaking. The difficulty, generally of itself sufficiently great, is frequently very much enhanced by the tortuous, contracted, or constricted condition of the auditory tube, and by the pain, tumefaction and discharge which are likely to be present whenever the substance has been retained for any length of time. Various methods may be employed for accomplishing the object, the choice of which must be regulated by the circumstances of each individual case. If the body is relatively small to the size of the tube, and not very rough or heavy, dislodgment may usually be effected with the syringe, charged with tepid water, the fluid being thrown up in a full, steady, and forcible stream, with sufficient care, of course, not to injure the membrane of the tympanum. This procedure should always be employed when the substance lies deeply in the auditory passage; for, although it may not cause its expulsion, it will often bring it within reach, and thus favor extraction. During the operation, or rather as a preliminary step, the ear should be drawn upwards, outwards, and backwards, so as to efface the angle of the canal. The syringe, which should hold at least four ounces, should have a long, slender nozzle, in order that the current may pass readily by the side of the foreign body.

When the substance is comparatively superficial, it may frequently be seized and extracted without difficulty, the best instrument for this purpose being a pair of very delicate toothed forceps, fig. 213, or the rectangular forceps of Toynbee, fig. 214. But such a procedure is not admissible when the substance is smooth, hard, or deep-seated; for, in the former case, the instrument will be likely to slip off, and in the latter, it will be impossible to give the blades the requisite degree of expansion for grasping it. If, under such circumstances, the surgeon is determined to succeed, his efforts cannot fail to be productive of serious

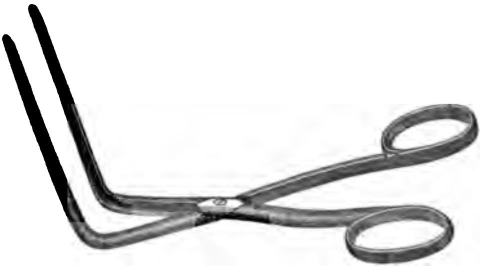
Fig. 213.



Toothed forceps.

mischief. The foreign substance will be thrust about in various directions, and perhaps pressed rudely against the membrane of the tympanum, until it is buried in blood, and the patient put in great agony. Cases have occurred where the surgeon, in his anxiety not to be baffled, severely lacerated the auditory tube and even the membrane of the tympanum, causing violent inflammation, followed by death.

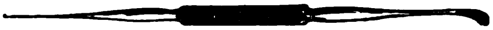
Fig. 214.



Toyubee's rectangular forceps.

For a number of years past I have depended entirely, in these operations on the ear, upon the use of the little instrument, represented in fig. 215. It is composed of steel, is five inches in length, and is now regularly put up in the ordinary pocket-case, manufactured in this city. One extremity is spoon-shaped, while the other, which is exeeedingly narrow, is provided with a very delicate tooth placed at a right angle. The small end is the one which I generally prefer, as it may always be easily insinuated between the auditory tube and the intruder, which is then gently dislodged, the instrument acting either as a lever or a hook, or both, according to circumstances. The large extremity is best adapted to the extraction of wax. Such a contrivance, as I know from repeated trials, is incomparably superior for the removal of all kinds of foreign bodies to the syringe and the forceps, however ingeniously constructed or dexterously managed. As to the ordinary pocket probe, bent at the point, no sensible surgeon should ever think of employing it.

Fig. 215.



The author's instrument for the removal of foreign matter from the ear.

Children are often brought to the surgeon with the ear in a high state of inflammation from previous attempts at extraction. When this is the case, the proper plan is to wait a short time before the attempts are renewed, measures being, meanwhile, employed to subdue the morbid action; as warm anodyne fomentations, the application of a few leeches over the mastoid process, and the administration of a brisk cathartic.

When a foreign body finds its way into the middle ear, through an opening in the membrane of the tympanum, dislodgment will be extremely difficult, if not impossible. Deleau relates a case where, a small pebble having got into this cavity, he succeeded in effecting clearance by throwing a stream of warm water into it through the Eustachian tube.

Insects are, in general, easily dislodged with the syringe. It is only when they are of large size, or much expanded, that it may be necessary to remove them with the forceps, hook, or curette. When a suitable instrument is not at hand, they should instantly be destroyed, or forced out of their hiding-place, by filling the ear with olive oil, tepid mucilage, or a mixture of spirits of camphor and water.

Finally, during the extraction of the foreign body, whatever it may be, the head should be properly supported by an assistant, and resistance counteracted by the use of anæsthetics. Unless this is done, the operation will be one of great difficulty, and attended with severe pain, if not serious injury to the parts.

C. ACCUMULATIONS OF WAX.

This substance sometimes collects in such quantities in the auditory tube as to produce complete occlusion; at other times the obstruction is only partial, attention being directed to the subject before the accumulation has made much progress. The effects, in either case, are more or less noise in the ear, generally of a buzzing, ringing, or explosive character, and impairment of hearing on the affected side. Occasionally there is complete deafness. This result may depend solely upon the long disuse of the ear from the protracted retention of the secretion, or it may be produced by the pressure of the wax upon the membrane of the tympanum, eventuating in organic disease of its substance, as ulceration, or induration and thickening.

When the wax is very hard and dry, and the meatus is completely impacted with it, it may press so hard against the tympanum as to cause constant giddiness, often conjoined with a sense of weight and fulness in the head, confusion of ideas, and tottering in walking.

An accumulation of wax does not necessarily imply an inordinate secretion of this substance; on the contrary, it may be deposited unusually sparingly, and yet, owing to its inspissated character, it may proceed until it completely fills the external meatus. Indeed, so long as this secretion retains its natural qualities, and no obstacle is offered to its evacuation, it is very seldom that we find it disposed to remain in the ear; but such an occurrence is very easy when it is deprived of its fluidity, whether in the act of deposition or soon afterwards. However this may be, whenever the wax is long retained it is always remarkably hard and tough, and then often contains a considerable quantity of hair and epidermic scales, the whole forming a dry, almost pulverulent mass, accurately moulded to the auditory tube, excluding the air, and inducing pretty complete deafness. The presence of the substance is generally easily detected by its dark brown or blackish appearance, and by our inability to discover the membrane of the tympanum.

Collections of wax occur at all periods of life; and they are generally caused either by suppression of the cutaneous perspiration, by the admixture of dust with the cerumen, by disorder of the general health, or by disease of the auditory tube.

Ear-wax being in great measure soluble in water, the best method of softening and detaching it is to throw this fluid freely into the auditory tube with a large syringe with a slender narrow nozzle. The water should always be used warm, and its efficacy will be much increased if it be mixed with a small quantity of soap and ether, or carbonate of soda, as half a drachm to the ounce of fluid, which, by combining chemically with the wax, gradually convert it into an oleaginous mass. Many practitioners are in the habit of employing oil for this purpose, but, as this substance is destitute of soluble properties, the only way in which it can prove serviceable is by lubricating the walls of the external meatus. When the wax is very abundant, or firmly impacted in the tube, I am in the habit of attacking it at once with the spoon-shaped extremity of the instrument delineated in fig. 215; or, instead of this, an ordinary curette, fig. 216, may be employed. Care must be taken, in performing the operation, to proceed as gently as possible, picking out piece after piece, until the whole mass has been removed; it being remembered that the long retention of this substance always renders the parts remarkably sensitive. Should any fragments remain at the sides and bottom of the cavity, they may afterwards easily be dislodged with the syringe and tepid water. Clearance having been effected, all that is necessary is to protect the ear, provided it is unusually tender, with a pellet of cotton to exclude the air; otherwise even this precaution may be dispensed with. When the membrane of the tympanum is very vascular, inflamed, or ulcerated, it will be proper to apply a few leeches over the mastoid process, to cover the ear with cloths wrung out of hot water, and to administer an anodyne diaphoretic. When the tendency to re-accumulation continues, the ear should be fre-

Fig. 216.

Curette.

quently syringed, and means taken to check the inordinate action of the ceruminous glands, upon which it depends, by the use of purgatives and attention to the general health.

Several remarkable cases are recorded of persons who, after having been long deaf, were suddenly relieved by the discharge of hard plugs of wax during bathing, the expulsion having generally taken place with a loud report, like that of a small pistol. Such an occurrence can only be explained by supposing either that the steam of the hot water, penetrating the meatus, softens the indurated mass, or, what is more plausible, that the bathing excites perspiration in the walls of the tube, thus detaching the substance, the noise being produced by the rarefaction of the atmosphere behind it.

d. POLYPOUS AND FUNGOUS GROWTHS.

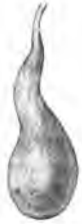
Great confusion has hitherto prevailed among pathologists respecting the true distinction between polypous and fungous growths of the ear, these terms being generally applied indiscriminately to every form of tumor, whether developed within the tube or projecting from its outer orifice. I have long been in the habit of looking upon these morbid products as being essentially different, and in my lectures I have always described them as being divisible into two classes, one of which is similar to the tumors which we so often observe in the nose and other mucous canals, while the other essentially consists of a mass of granulations, bearing only a faint and distant resemblance to genuine polyps.

Of *polyps* of the ear there are several varieties, of which the most common are the fibro-vascular, gelatinoid, and granular. Their structure is sufficiently indicated by their names. They are generally somewhat of a conical, pyriform, or globular shape, having a small, narrow pedicle, by which they are attached to the surface from which they grow, which is usually the posterior wall of the meatus, at the site of the ceruminous glands, or in their immediate vicinity. Occasionally, though rarely, they spring from the membrane of the tympanum itself, or very low down in the tube. Their surface is commonly smooth, and of a florid, pale, or pink hue, according to the character of their structure, or, rather, the extent of their vascularity. A polyp of the ear has sometimes the form, color, and consistence of a mulberry, or of a bunch of small grapes. Their number rarely exceeds one, unless they are very small, when there may be two. As they increase in size, they gradually approach the external orifice of the ear, and sometimes partially fill up the concha, forming a hard, cuticular mass, several shades lighter than the part which is buried in the tube, and also much less sensitive.

These bodies, of whatever structure, size or shape, are attended with more or less discharge, which is either of a thin, sanious, or truly purulent character, very fetid, and often so acrid as to erode the surrounding surface. The hearing is always impaired, and in many cases completely destroyed. The nature of the tumor is easily recognized by its history and appearance. Its point of attachment is generally ascertainable with the probe, which may be readily insinuated between the growth and the auditory tube, no matter what may be its age.

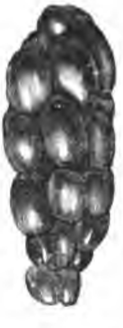
The annexed sketch, fig. 217, represents a gelatinoid polyp, which I removed from the right ear of a man of twenty-six, where it had been growing for nearly three years. It was attached to the floor of the meatus, not quite as low down as its centre, by a narrow, slender pedicle, the base protruding slightly at the outer orifice. It was of a pale, whitish color, like an oyster, somewhat elastic, insensible, and smooth on the surface, with here and there a straggling vessel ramifying beneath its lining membrane. The drawing is of the natural size. Fig. 218, copied from Mr. Wilde, represents a singularly lobulated form of aural polyp. Fig. 219, from a drawing by Dr. Packard, illustrates the microscopical characters of a recurring fibroid polyp, which I removed from the ear of a young woman at the clinic of the Jefferson Medical College in 1860. It occupied the whole of the auditory tube, and had already been operated upon twice.

Fig. 217.



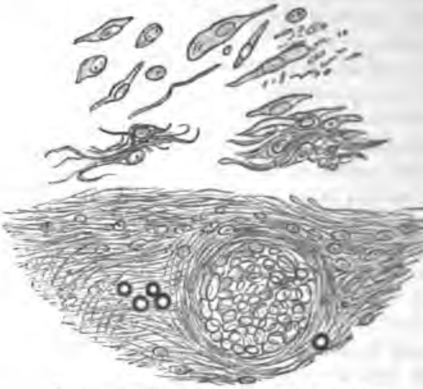
Gelatinoid polyp.

Fig. 218.



Lobulated polyp.

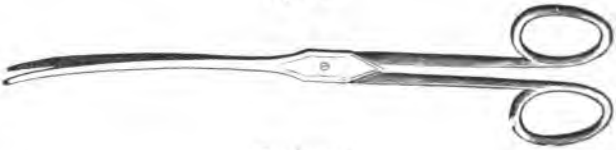
Fig. 219.



Microscopical characters of a fibroid polyp.

Polyps of the ear are best removed by avulsion with a pair of delicate fo
either straight or curved, as in fig. 220, applied, if possible, close to their pe

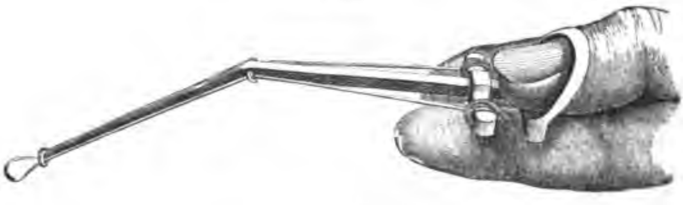
Fig. 220.



Ear forceps.

and rotated upon their axis. If a portion of the tumor is left behind, de
the cavity, it may be scraped away with a curette, or cut off with a pair of c
scissors. Instruments have been devised for ligating these growths; bu
cepting the ingenuity expended upon their construction, they have little to r
mend them. Fig. 221 represents the aural canula of Mr. Wilde. Ca

Fig. 221.



Wilde's aural canula.

should never be employed for removing polyps of the ear, as it is extremel
ficult so to regulate the application as to prevent pain and other mischief.
there is a strong repullulating tendency, recourse may be had to the cautiou
of nitrate of silver, sulphate of copper, dilute acid nitrate of mercury, or,
is better than all, chromic acid.

The second division of the subject embraces what are called *fungous gr*
of the ear, a class of affections much more common than polyps. They co
essentially, of a mass of granulations, of a soft, spongy consistence, and of a
florid color, which have their origin generally in an ulcerated condition o
auditory passage, the membrane of the tympanum, or the tube and drum toge
Occasionally, the immediate cause of their production is necrosis of the pe
portion of the temporal bone, or disease of the ossicles of the ear. Ho

induced, the growth often attains a large volume, filling up the meatus, and projecting sometimes a considerable distance into the concha. It is often quite sensitive, readily bleeds when rudely touched, and is always attended with a profuse, foul discharge.

As these formations are always of a secondary nature, it is evident that they cannot be permanently cured until the cause, under the influence of which they are developed, has been effectually eradicated. The first object of the treatment, therefore, should be to get rid of the primary affection, whatever this may be. Meanwhile, however, any exuberant growth is removed either with the scissors, the knife, or the forceps, as may seem most convenient, repression being afterwards controlled by the cautious application of the ordinary escharotics. Cleanliness is an object of paramount importance in this form of the affection, and is best promoted by the frequent use of injections of tepid water, with castile soap and a small quantity of the chlorides.

A *sebaceous tumor* occasionally forms in this tube. Mr. Toynbee, who first called attention to the disease in 1861, states that it may acquire a considerable bulk, and that its presence is rarely suspected until it causes deafness, more or less discharge, or cerebral disturbance. If permitted to proceed, it may produce absorption of the mastoid cells, tympanum, or petrous bone, and thus lead to very serious, if not fatal, consequences. Its softness and elasticity readily distinguish it from bony tumors of the meatus. The only remedy is thorough excision.

Malignant tumors sometimes grow in this situation, commencing either in the soft structures, in the petrous portion of the temporal bone, or in the mastoid process. Whether certain forms of polyps or of fungoid excrescences, described in the preceding paragraphs, are capable of assuming this kind of action remains to be determined, but such a conclusion is certainly not unreasonable. However this may be, the malignant growth is, in general, easily recognized by the peculiarity of its color, which is always purple or livid, by the rapidity of its development, by its tendency to extend, not only outwardly, but laterally, in every direction, by its speedy reproduction after removal, by the almost insupportable fetor of the discharge, by the excessive pain, and, lastly, by the early involvement of the neighboring lymphatic ganglions. The constitution gradually becomes affected, and the patient at length sinks under all the symptoms of the cancerous cachexia, or he dies suddenly, and perhaps unexpectedly, from effusion upon the brain.

Such cases, which are fortunately rare, hold out no prospect of relief from any course of treatment of which we have any knowledge. All that can be done is to palliate the symptoms, and to smooth the sufferer's passage to the grave.

e. INFLAMMATION.

The auditory tube is liable to several forms of inflammation, either of a simple or specific character, which, although infrequent, are worthy of special notice on account of the severe suffering which they entail.

The most common variety of inflammation is the simple, which usually begins, so far as we are able to judge, in the skin and cellular tissue of the tube, from which it often extends to the periosteum, and even to the superficial portion of the bone. The disease, in the severity of suffering which it induces, bears a very striking resemblance to paronychia. It is usually ushered in by a dull aching sensation, which is soon converted into a violent throbbing pain, attended with a feeling of weight and obstruction, and various kinds of noises in the ear. The swelling is slow, but as it proceeds it often causes complete occlusion of the tube, and affects the parts around the ear, which are always exquisitely tender, and intolerant of the slightest pressure and motion. When the disease is at its height, the patient is unable to masticate, and to lie on the affected side. Headache and constitutional disturbance generally attend, and there is, in most cases, a strong tendency to suppuration, the matter being, however, always small in quantity, and deep-seated.

The origin of this disease is not well understood. It is often witnessed in persons who are apparently in the most robust health. In general, however, it arises from cold, or a disordered state of the digestive organs from over-feeding, intemperance, and other causes. Occasionally it occurs as a sequel of measles, scarlatina, typhoid fever, and smallpox. When the inflammation attacks an individual already much debilitated by disease, it may prove dangerous by involvement of the brain and arachnoid membrane. When an abscess forms, the matter discharges itself either into the auditory tube, or it finds an outlet in the immediate vicinity of the ear, either just in front of the temporo-maxillary articulation, or over the root of the mastoid process.

The *treatment* must be rigidly antiphlogistic. If the symptoms are urgent, and the patient is robust, it may be necessary to take blood from the arm, to purge him actively, and to subject him to the use of the antimonial and saline mixture, with anodynes to allay pain and procure sleep. In general, however, these remedies may be dispensed with, as the object may readily be attained by the application of leeches to the anterior and posterior part of the ear, anodyne fomentations, light diet, and diaphoretics, especially if an early and free incision is made, which is often just as necessary here as in whitlow, or in an ordinary phlegmonous boil. The opening should be deep rather than extensive, reaching down to the bone, so as to afford free vent to the confined fluid. When the disease is slow in disappearing, or when abscess after abscess forms, a course of alterative and tonic medicine will be indicated, along with a proper regulation of the diet, and change of air.

This disease occasionally assumes an *erysipelatous* type, or it may possess this type from the commencement. Its nature will be denoted by the peculiar discoloration of the skin, by the tendency of the morbid action to spread over the surrounding parts, and by the peculiar burning, itching, or stinging character of the pain. The treatment does not differ essentially from that necessary in the preceding case, only that the inflamed surface should be painted freely with dilute tincture of iodine, and that, if matter form, the incision should be somewhat more extensive.

f. HERPETIC AFFECTIONS.

The auditory passage is occasionally the seat of herpetic disease, either as a primary affection, or as a propagation from the auricle, where it is by no means uncommon. It is characterized by the formation of numerous vesicles, generally more minute than the smallest pin-head, closely grouped together, if not confluent, and filled with a thin, whitish, or slightly yellowish fluid. The surface upon which the eruption rests is of a dusky reddish appearance, and the seat of intolerable itching. When the vesicles break, they are replaced by little ulcers, chaps, or fissures, discharging a thin, sanious fluid, which may be so copious as to run out upon the ear, and even upon the patient's pillow. The auditory tube is red, swollen, angry-looking, tender, and, at times, even quite painful from the great extent of disease. The suffering is increased by exposure, by the use of stimulating food, and by disorder of the alimentary canal. The affection may last for years, and finally extend to the membrane of the tympanum. Besides the itching, which is always a prominent symptom, the patient is troubled with noises in the ears, and with partial deafness.

In the *treatment* of this affection, particular attention must be paid to the state of the general health, which always exercises a remarkable influence upon its progress and duration. The secretions must be improved by a mild course of alteratives, the diet must be plain and non-stimulant, and the bowels must be moved from time to time with vegetable cathartics. If the patient is robust, the antimonial and saline mixture may be of service; and in obstinate cases it may be necessary to have recourse to gentle ptyalism, followed by the use of iodide of potassium. The best local applications, at the commencement of the treatment, are leeches with warm water-dressing, and afterwards, when the morbid action has been somewhat moderated, weak solutions of bichloride of mercury, acetate of lead, or iodide of iron, or, what I prefer to everything else, the ointment of the oxide of zinc, diluted with three parts of prepared lard.

g. INFLAMMATION OF THE CERUMINOUS GLANDS.

The glands which secrete the wax of the ear are liable to inflammation, either as a consequence of the suppression of the cutaneous perspiration, disorder of the digestive apparatus, the extension of some specific disease, irritation of the gums, as in teething, or the presence of a foreign body. Its characteristic is an inordinate secretion of cerumen, accompanied with a sense of fulness and uneasiness deep in the auditory tube, which is at the same time perhaps considerably swollen, though rarely as much as in the more common forms of inflammation. The wax is of a pale-yellowish color, of a thin consistence, almost like water, and so abundant as to run out of the ear in considerable quantity. If it be allowed to remain, it closes up the passage, becoming thick and hard, of a dark-brownish, or blackish color, and firmly adherent to the walls of the tube. Ordinarily there is little or no impairment of the hearing, but nearly always more or less noise in the ear, especially when the disease extends to the membrane of the tympanum, in which case there may also be considerable deafness.

The *treatment* of this inflammation does not differ from that of the more ordinary forms. An active purgative with light diet, and a few leeches behind the ear, generally suffice to put a speedy stop to the morbid action. If the disease has been the result of cold, benefit will arise from the use of diaphoretics, as Dover's powder, or a combination of antimony and morphia. To clear away the wax, tepid water, containing a little soap, should be gently injected into the ear, followed by some mildly astringent lotion, as a very weak solution of nitrate of silver, acetate of lead, or sulphate of copper and tannin.

h. HEMORRHAGE.

Hemorrhage of the ear is a rare occurrence. It may be the result of external injury, or of ulceration of a tolerably large vessel, and may have its seat either in the auditory tube, in the cavity of the tympanum, or in the parts immediately around the petrous portion of the temporal bone. Cases have occurred where the bleeding was so large and unmanageable as to lead to the belief that it proceeded from the internal carotid artery, laid open by an extension of the morbid action from the ear. The blood, in these cases, gushed out of the meatus in immense quantities, and, although it could be temporarily controlled, it ultimately caused death by exhaustion. When it proceeds from, or passes through, the cavity of the tympanum, it also escapes at the Eustachian tube, from which it is either ejected along the mouth, or, as is more common, it descends into the stomach. In fractures of the base of the skull, involving the meninges and the petrous portion of the temporal bone, there is often a copious discharge from the ear, at first of pure blood, and afterwards of sanguineous serum. Sometimes the bleeding is vicarious of the menstrual flux.

Aural hemorrhage is to be treated upon the same principles as hemorrhage in other parts of the body; by attention to position, the exhibition of opium and acetate of lead, cold applications to the mastoid process and the back of the head, and the use of the tampon. When the blood issues from the fauces, the Eustachian tube should be plugged with the catheter, its extremity being surrounded by a bit of sponge to secure more accurate closure.

SECT. III.—DISEASES OF THE MEMBRANE OF THE TYMPANUM.

a. WOUNDS.

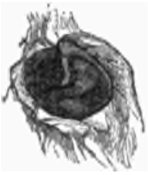
The membrane of the tympanum is liable to various kinds of wounds, either as the result of violence directly applied, or as concomitants of fractures of the skull. In the latter case it is probably more frequently injured than is generally supposed. It is an interesting fact to know that, when the lesion is not too extensive, it is readily repaired by an effusion of plastic matter, the process employed by nature being the same as in the healing of wounds in other parts of the body.

Independently of clinical observation, which long ago established the fact, the experiments of Valsalva are perfectly conclusive upon the subject, proving that wounds of this membrane are susceptible of cicatrization, even when they are accompanied by a considerable loss of substance. This distinguished physician repeatedly perforated and even lacerated the membrane of the tympanum in dogs, which, after some time, he killed, when he found that the injury had been most thoroughly repaired in every instance. Similar experiments have been performed since the time of Valsalva by physiologists and surgeons, with precisely similar results. In the operation of excising a portion of the membrane for the cure of deafness, formerly so much in vogue, the great trouble has been to prevent the opening from closing. From all these facts, then, we may deduce the interesting conclusion that wounds of this membrane, even when attended with considerable loss of substance, are, in general, easily repaired. To promote this occurrence, in case of accident, the treatment should be strictly antiphlogistic, particular attention being paid to the position of the head, and free use being made of leeches behind the ear.

b. RUPTURE.

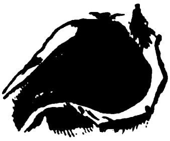
Rupture of the membrane of the tympanum may be produced in several ways, as a fall upon the side of the head, a box on the ear, blowing of the nose, and the forcible introduction of a foreign body, as exhibited in the accompanying sketches, figs. 222, 223, and 224, from Toynbee. The occurrence is generally attended with a loud noise, not unlike that caused by the discharge of a pistol, some hemorrhage, and a good deal of pain. As the edges of the rent retain their contact, the lesion is soon repaired by the interposition of lymph, without any permanent impairment of the hearing.

Fig. 222.



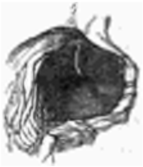
A fissure in the lower part of the tympanic membrane from a box on the ear.

Fig. 223.



A fissure in the posterior part of the tympanic membrane from blowing the nose.

Fig. 224.



A fissure in the tympanic membrane caused by a twig.

c. INFLAMMATION.

Inflammation of the membrane of the tympanum may arise from various causes, as exposure to cold, external injury, or the presence of a foreign body. It is a frequent sequel of measles, scarlatina, and smallpox, and is often directly dependent for its origin upon a strumous state of the system. Infants and young children are most prone to its attacks, especially such as are naturally of a delicate constitution, or who have suffered from poverty and want. When this is the case, it is often induced by the most trifling causes, and followed by the most disastrous consequences, such as partial destruction of the membrane, and partial or complete deafness.

Upon examining the inflamed membrane, with the aid of a strong light, it will be found to exhibit a pale rose color, which, as the morbid action advances, is generally converted into a deeper hue. Small, straggling vessels are seen ramifying over the affected surface, and the part, instead of being thin and transparent, as it is in the natural state, is thick and opaque, from interstitial deposits. The inflammation often affects the adjoining parts, especially the bottom of the auditory tube, and, when this is the case, there is also apt to be an increase of cerumen, soon followed by suppuration, or a discharge of muco-purulent matter.

Tympanitis is characterized by the existence of more or less pain, situated deep in the ear, and extending to the side of the head; it is generally described by the patient as exceedingly sharp, aching, and distressing, and is always aggravated by loud noise, stooping, coughing, or sneezing, and by exposure of the part to the cold air. As the disease approaches the suppurative point, the pain generally becomes throbbing, and almost agonizing, depriving the individual both of appetite and sleep. The parts around are now more or less tender, and the movements of the jaw add greatly to the local distress. The sense of hearing is usually considerably exalted; loud, cracking, or ringing sounds are perceived, and there is often a feeling of fluttering as if an insect were flying about in the ear. The inflammation, if at all severe, is attended with high symptomatic disorder, and occasionally with delirium.

In the *treatment* of acute tympanitis, active antiphlogistic measures are indicated, and they should be employed with the least possible delay, with the twofold object of saving structure, and preventing cerebral involvement, two great dangers in every severe attack of this kind. If the pulse is strong and full, the pain excessive, the mind delirious, and the skin hot and dry, blood must be taken freely from the arm, the operation being followed by the application of leeches over the mastoid process, a brisk purgative, the hot foot-bath and the antimonial and saline mixture, with a sufficiency of morphia to relieve suffering and induce sleep. Copious diaphoresis should be aimed at, and promoted by tepid drinks. The steam of hot water, directed upon the ear and the adjacent parts by means of a funnel inverted over a large pitcher, will often prove exceedingly grateful, and afford more decided comfort than almost anything else. Its efficacy may be greatly enhanced by the addition of laudanum and powdered camphor, or camphor dissolved in alcohol. Covering the parts with a large emollient poultice, or hot cloths, will also be productive of great amelioration. The patient's head should be constantly maintained in an elevated position, noise should be excluded from the apartment, and the surrounding temperature should be regulated with the thermometer, especially in cold weather. If cerebral involvement is threatened, leeching and counter-irritation will be necessary. In the event of there being any discharge, the syringe and tepid water may be had recourse to, but it is impossible to be too careful in their use, otherwise they will be sure to aggravate the disease instead of diminishing it. As to any direct application, the only one at all admissible, as a general rule, consists of equal parts of laudanum and sweet oil, slightly warmed, and introduced into the bottom of the ear, in immediate contact with the affected surface. Irritating lotions always prove prejudicial, and cannot be too much condemned.

d. ABSCESS AND GANGRENE.

Inflammation of the membrane of the tympanum probably terminates much more frequently in the formation of *abscess* than practitioners are aware; but, owing to the difficulty of examining the parts when thus affected, the occurrence commonly escapes detection. The pus is seated in the submucous cellular tissue, and, although very small in quantity, generally leads to perforation of the membrane, and the discharge of the small bones of the ear; its formation being ordinarily preceded by rigors and delirium. The treatment is antiphlogistic. If the abscess is accessible, evacuation is effected by a cataract needle, and cicatrization promoted by the cautious application of nitrate of silver, upon the extremity of a probe.

Of *gangrene* of the membrane of the tympanum little is known. Such an event is doubtless possible, and probably occurs not unfrequently, especially in scrofulous subjects, as a consequence of eruptive disease. If this were not so, how could we explain the extensive destruction of this membrane which occasionally takes place within a few days after the establishment of inflammation, the occurrence of necrosis in the temporal bone, and the almost insupportably fetid discharges which attend certain diseases of the ear?

e. ULCERATION AND OTORRHŒA.

Ulceration of the membrane of the tympanum may be an effect of ordinary inflammation, both acute and chronic; or it may be caused by a strumous or syphilitic taint of the system, most generally the former. The erosive action may display itself in the form of little superficial abrasions, not larger, perhaps, than a small pin-head, and of a circular or oval shape; or in that of a deep and broad surface, with abrupt and well-defined edges, rapidly followed by perforation of the affected part, and the discharge of some of the bones of the ear. The ulceration often proceeds until the whole membrane is destroyed, and all the adjacent parts, osseous as well as soft, are involved in the mischief. In such cases the morbid action sometimes extends to the substance of the temporal bone, and thence along to the brain and its meninges, leading to various effusions and the formation of abscesses, from which the patient seldom, if ever, recovers. In some cases there is, in addition to these affections, facial paralysis, from involvement of the portio dura, in consequence of the propagation of the ulceration through the aqueduct of Fallopius.

From what I have seen of this affection I am satisfied that, in nearly every case in which it does not proceed from a mechanical cause, it is of a strumous nature. The subjects are generally young, delicate children, who are either the offspring of persons who have perished from phthisis or from some allied disease, or who are themselves destined to become affected in that way. The exciting cause of the complaint is either exposure to cold or an attack of measles, scarlatina, or some other eruptive malady, whose tendency is to impoverish the blood and exhaust the vital powers. The ulceration is frequently of a very insidious character, coming on, without any pain, during the convalescent stage of the cutaneous disease, and continuing, with, perhaps, but little intermission, for an almost interminable period. We often meet with cases of this kind which have lasted for five, ten, and even fifteen years. The discharge is generally of a thick, cream-like consistence, of a yellowish color, verging upon greenish, and so horribly offensive as to render the patient disagreeable both to himself and to those around him. Exposure to cold, derangement of the digestive organs, and neglect of cleanliness, always aggravate it. It is often attended with fungous, or polypous growths, and is liable, unless closely watched, to be followed by inflammation of the brain and its membranes. A sudden suppression of such a discharge, especially if accompanied by severe headache, should always be regarded with suspicion.

When ulceration, by whatever cause induced, is of long standing, or of considerable extent, deafness, more or less complete, is the inevitable consequence. All, therefore, that can be done in such a case is to endeavor to arrest the disease, and happy is the surgeon who can succeed in his efforts; for it may truly be asserted that there is no affection which is more unmanageable, or more difficult to be brought under the influence of remedies. As to any improvement of the hearing, that is an occurrence hardly to be thought of. It is only when the disease is slight, and the constitution has not been impaired by previous suffering, that relief is to be looked for in this respect. The practitioner, indeed, cannot be too guarded in his prognosis. His rule of conduct should be to do all he can, but to promise nothing.

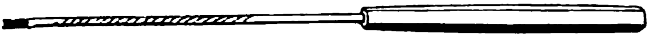
Persons laboring under the more aggravated forms of this disease occasionally perish from an extension of the morbid action to the petrous bone, or to this bone and the brain and its envelops. The danger is always greatest in very young children, in whom this bone consists almost entirely of diploë, or of a soft spongy structure inlaid with veins. In some cases, secondary phlebitis arises, apparently from an extension of the disease along the cerebral sinuses and internal jugular veins. The parts most liable to suffer in this manner are the lungs, pleura, liver, and joints. The symptoms announcing these events are such as ordinarily usher in the occurrence of pyemia. The most prominent are rigors, or chilly sensations, alternating with flushes of heat, and rapid exhaustion of the vital powers, with excessive restlessness and a tendency to low muttering delirium, especially when there is serious involvement of the brain. In the latter case, there will also be violent cephalalgia, and agonizing pain in the affected side of the head.

The *treatment* of ulceration of the membrane of the tympanum must, in general, be conducted empirically. When the disease has been induced by the presence of a foreign body, or the retention of pus from some morbid growth, the removal of the exciting cause will often of itself be sufficient to effect a cure; but where no positive information exists respecting this point, our course must, necessarily, be one of uncertainty. A careful examination should always be made before we begin the treatment of the condition of the parts, by washing out the ear with tepid water, thrown in gently with a large syringe. The prominent indications are, first, to allay fetor, and, secondly, to arrest the morbid action. The former is fulfilled by the cautious use of chlorinated soda, injected into the ear twice or thrice in the twenty-four hours; the latter, by counter-irritation, the topical application of nitrate of silver, chloride of zinc, or permanganate of potassa, and by attention to the state of the system.

When the disease is of a strumous nature, or associated with debility, an alterant and tonic course will be indicated, consisting of iodide of iron and extract of cinchona, alternated with cod-liver oil, and aided by nutritious diet and exercise in the open air. The surface should be well protected, and sponged daily with tepid salt water, followed by dry friction. Too much attention cannot be paid to cleanliness; for, apart from the offensive character of the discharge, the accumulation of pus in the ear must necessarily tend to keep up the morbid action, and to increase the mischief. Nitrate of silver is undoubtedly among our best topical remedies, but too much caution cannot be employed in its use. The strength of the injection should not exceed, at first, the eighth of a grain of the salt to the ounce of water, from which it may be increased to the fourth of a grain or even more, according to the tolerance of the affected surface. Another excellent article is bichloride of mercury, used still weaker; it is particularly valuable in the scrofulous form of the disease, attended with an abundant discharge. Iodide of iron, sulphate of copper, acetate of lead, and sulphate of zinc, are, under similar restrictions, also proper remedies.

Solid nitrate of silver may sometimes be advantageously employed in this affection, but it should be applied with extreme caution, otherwise it will inevitably do mischief. Perhaps the best instrument for the purpose is that of Mr. Wilde, sketched in fig. 225. It consists of a silver tube, six inches long, cut spirally for about three-fifths of its length, and having an aperture in the side, or a hollow at the end, filled with the salt melted over a spirit-lamp. The elastic spring may be bent to any point, and is so yielding as to prevent injury to the ear from the starting of the patient. The caustic should be brought in contact only with the edges of the ulcer, by the lightest possible touch, the application being repeated about once every fourth day.

Fig. 225.



Wilde's port-caustic.

Whatever the applications may be, care must be taken not to let the discharge dry up too rapidly, lest disease should be excited in the brain and its membranes. This precaution is particularly necessary in cases of long standing, accompanied with extensive disorganization of the structures of the ear. To obviate this occurrence, and at the same time aid in arresting the ulcerative action, an issue should be established behind the ear, over the mastoid process, and kept open for a long time after all disease has apparently vanished. When symptoms of cerebral involvement arise, they must be promptly met by leeches, blisters, and such other means as will readily suggest themselves in a case of such emergency.

Should the disease be of syphilitic origin, it will be necessary, in addition to the local means here pointed out, to place the patient upon the use of iodide of potassium, either alone or in conjunction with bichloride of mercury, in small doses, continued sufficiently long to produce slight ptyalism.

To the disease now described the term *otorrhœa* is usually applied; and practitioners, in prescribing for it, unfortunately too often forget that the discharge which accompanies it is merely a symptom of the affection, and not the disease itself. Another mistake which is often committed is the belief that the malady upon which the discharge depends will in time disappear spontaneously, or, to use a vulgar phrase, that the patient, especially if a child, will gradually outgrow it. Such an opinion is as absurd as it is culpable, and cannot be too severely censured. The poor patient, confiding in the judgment of his professional adviser, goes on from bad to worse, until, awakening from his dream, he finds that his ear is completely disorganized, and that he is irremediably deaf. Such cases are of constant occurrence in every community; and, while they are calculated to awaken our sympathy for the sufferer, they cannot fail to excite our indignation at the surgeon, who, either through ignorance or indolence, or both, neglects to make himself acquainted with the nature and treatment of the disease.

SECT. IV.—INFLAMMATION OF THE CAVITY OF THE TYMPANUM.

This disease, which has been variously designated by aural surgeons, the terms being nearly all more or less objectionable, is seated in the lining membrane of the middle ear, which is continuous, along the Eustachian tube, with that of the fauces. As it progresses it may invade other structures, such as the fibrous layer of the tympanum, and even the labyrinth; or, beginning in these, it may extend to and involve the mucous tissue secondarily. Unfortunately, our knowledge of the maladies of these delicate parts of the organ of hearing is too limited to enable us to speak very positively upon the subject; their deep situation, the difficulty of exposing them, and the infrequency of their fatality, being so many reasons of the imperfection of our information. Inflammation here is probably more common than is generally imagined, and it is not at all unlikely that some of the fatal cases of disease of the base of the brain, which we meet with, from time to time, have their seat originally in the middle and internal ear.

Of the *causes* of this disease, it is not always, if indeed generally, possible to form a correct idea, as they are usually very obscure. The patient, if old enough to give an account of himself, often ascribes it to the effects of cold, from exposure, perhaps to a shower, sitting in a draught, or bathing in cold water. He is conscious, at any rate, that he was seized soon after with pain in the ear, and he is consequently disposed to refer his suffering to that particular source. However this may be, it is certain that this kind of exposure is the most frequent exciting cause of internal otitis. It may also be induced by external injury, by the presence of a foreign body, by irritating applications to the membrane of the tympanum, and by an extension of inflammation from the tonsils and fauces along the Eustachian tube. Children and young persons are its most common subjects, especially such as are of a strumous predisposition. Occasionally the disease is caused by a syphilitic taint of the system.

The affection is ushered in by pain in the ear, which is speedily followed by fever, alternating with rigors. The pain is deep-seated, and, rapidly increasing, soon amounts to intense agony, being of a tearing, boring, dragging, or pulsatile character; it is aggravated by the slightest motion of the head, and darts about in different directions, as the temple, forehead, mastoid process, and teeth, which often ache most violently. Cephalalgia is generally present from the beginning, and is soon succeeded by delirium; the patient is unable to remain for a moment in the same position, and is harassed with all kinds of noises, while the sense of hearing is in the highest possible state of exaltation; the countenance is flushed, the eyes are suffused, and there is a wildness of expression indicative of the most intense suffering. In the worst forms of the affection, the pain extends along the Eustachian tube into the throat; the whole side of the head becomes exquisitely tender; the fever increases in intensity; coma at length sets in; and the patient expires under all the symptoms of disease of the brain and its membranes. In some cases, there is facial paralysis, from involvement of the portio dura in the aqueduct of Fallopius. Upon dissection, matter is found in the cavity of the tympanum, and also, not unfrequently, over the petrous portion of the temporal bone, with effusion of serum into the arachnoid sac. In protracted cases, the temporal bone is carious or partially necrosed, and separated from the dura mater by a distinct abscess. When the patient survives, the matter is sometimes suddenly discharged through the external ear, followed by partial relief of the frightful suffering previously endured. The mitigation thus produced, however, is often only temporary, death being caused afterwards either by exhaustion, or, as more generally happens, by inflammation of the brain and its envelops. The period at which this event happens varies from eight or ten days to several months. In the latter case, the patient is assailed by hectic irritation; he becomes weak and emaciated; his countenance exhibits a sallow, cadaverous appearance; there is a profuse discharge from the ear, or from the ear and the Eustachian tube; and the mind is feeble, incoherent, or fatuous.

In regard to the *diagnosis* there is hardly a symptom that is at all worthy of reliance. Perhaps the most important is the violence of the pain, the depth at which it is situated, its unremitting character, and its association with fever, rigors, and delirium. If the patient is a child, the head will be in constant motion, and the hand incessantly carried to the ear: an adult will express himself as being in great torture. The general excitement is higher than in external otitis, the ear is more intolerant of sound, and there is always marked delirium, usually beginning early, and lasting until the malady disappears or proves fatal. Another point of distinction of some value is that matter forms much later than in inflammation of the membrane of the tympanum, or of this structure and of the auditory tube, in which suppuration generally takes place in from twenty-four to forty-eight hours. Finally, there is more tenderness in the mastoid and temporal regions than in external otitis, and more pain in moving the head, sneezing, coughing, and mastication.

The *treatment* of internal otitis must be prompt and vigorous; for, as the disease is one of great danger both to the part and the system, no time should be lost in timidity and indecision. The most reliable remedies are general and topical bleeding, active purgation, the free use of the antimonial and saline mixture, the hot foot-bath, Dover's powder, and anodynes in doses sufficient to relieve pain and promote sleep. The best direct application is the steam of hot water, strongly impregnated with laudanum, tincture of aconite, and powdered camphor, and conducted to the ear by means of an inverted funnel, the head being well covered with a blanket during the operation. One great aim of the treatment should be to bring about early and copious diaphoresis, experience having shown that nothing exerts so powerful an influence, after proper depletion has been practised, over the morbid action. Noise is carefully excluded from the apartment, and the body steadily maintained in the semi-erect posture. As soon as the system has been sufficiently reduced, counter-irritation should be established over the mastoid process, and also, especially if the brain is likely to be involved, in the nape of the neck, at first by means of blisters, and afterwards by issue, croton oil, or tartar emetic ointment. If structural lesion is dreaded, mercury should be given in full doses, with a view to its speedy constitutional effects. Should matter form in the middle ear, as denoted by the convex and opaque appearance of the membrane of the tympanum, a puncture should be made to serve as an outlet to the pent-up fluid, its escape along the Eustachian tube being generally prevented by adhesive inflammation.

When the disease assumes the chronic form, our chief reliance must be upon tonics, light but nutritious diet, pyogenic counter-irritation, and the internal use of minute doses of mercury, with a view to slight but persistent ptyalism. The patient is carefully watched, and every precaution taken to protect the brain and prevent relapse.

SECT. V.—DISEASES OF THE INTERNAL EAR.

a. NERVOUS DEAFNESS

There is a species of deafness to which, for the want of a better ex the term nervous is applied. The symptoms which characterize it h been well understood, but as it respects its pathology we are still, in grea in conjecture. It resembles, in many of its essential features, amau was, for a long time, attributed to paralysis of the auditory nerve, as a was attributed to paralysis of the optic nerve. That such an occurrenc sible is undeniable, but that much more importance has been ascribed t it is entitled to, is equally true. Indeed, there is reason to believe th great majority of cases of what is called nervous deafness, the disease of being caused by a want of power in the nerve of hearing, as a prima depends wholly upon inflammation. This has certainly been ascertain the fact in regard to amaurosis, and that the same circumstance obtain tion to nervous deafness is now, I believe, generally admitted. Too mu cannot be laid upon this view, when we consider the influence which it m upon the treatment of this class of affections. Under the suppositio was, from first to last, a purely nervous disease, the most erroneous pra pursued, and this is, perhaps, one reason, among many others, why au dies have been so long a specialty in the hands of the empirics.

Of the exciting *causes* of this form of deafness, our information is reliable. In many of the cases that I have been consulted about the appeared spontaneously, without the patient being able to assign an whatever for its occurrence. Occasionally I have known it to come on s an attack of typhoid fever, attended with an unusually tardy conva Measles and scarlet fever are also sometimes followed by it. Severa worst cases of nervous deafness that I have ever seen, occurred, appa consequence of bathing in cold water, after the body had been overheat ercise. Profuse and long-continued diarrhœa, protracted hemorrhages, dinate use of purgatives, masturbation, and abuse of sexual intercou often been known to induce the affection. Another cause, and one which ing to my experience, is more than commonly operative, is chronic dysp rife among the people of this country.

The disease generally begins in one ear, and, after continuing for so attacks the other; or it may be confined to one ear exclusively; or, may commence simultaneously on both sides, and proceed uniformly or o until audition is completely lost. Sometimes the disease is produced a stantly. I saw, not long ago, a child, four years old, who went to bed well in the evening, and woke up completely deaf in the morning. Sudd and the concussion occasioned by the firing of a cannon or even a pis been known to deprive persons instantly of the faculty of hearing.

Nervous deafness is sometimes hereditary. I give the following notes which came under my observation some years ago, as an illustration of thi A young man, aged twenty-one, is partially deaf in his right ear, evide an affection of the auditory nerve; the disease has been coming on grad eighteen months, and is steadily increasing; it is attended with great as well as other disagreeable noises, and with occasional headache. never had typhoid fever, measles, scarlatina, or smallpox. He is on children. His eldest brother, thirty-five years of age, is very deaf in b a sister, aged thirty, suffers in one. The father is deaf in both ears, an paternal aunt. The paternal grandfather is likewise deaf. The moth well.

The first intimation which the patient usually has of his infirmity haps, derived from his friends, who, in their intercourse with him, are conscious that he does not hear so well as formerly. They are ob addressing him, to repeat their questions or answers more frequently speak in a louder tone and more emphatic manner. Simultaneously occurrence there are various noises in the ears, at first slight and occasional, but becoming gradually more and more intense and steady, until, in time, they constitute the great and absorbing symptom. In regard to the character of these sounds, nothing could be more strange and diversified. Thus, in one case they resemble the ticking of a watch; in another, the ringing of a bell; in a third, the buzzing of an insect; in a fourth, the chirping of a bird. In some instances they are like the rustling of the wind among leaves, the pattering of rain, the roaring of a water-fall, the motion of a saw-mill, the boiling of a tea-kettle, or the whistling of a steam-engine. These noises are generally confined to the ears, but cases not unfrequently occur in which they extend over the whole head, causing the most disagreeable and distressing feeling. Fatigue, loss of sleep, exposure to cold, damp states of the atmosphere, and the depressing passions, have the effect of increasing them, and of aggravating the patient's suffering, often producing fits of the most dreadful despondency. On the other hand, it is not unusual for slight improvement to occur, although it is generally very transient, lasting, perhaps, not more than a few hours, or, at most, a few days. During this time the hearing is not only improved, but there is a considerable diminution of sound, and illusive hopes are entertained of speedy recovery. Presently, however, the symptoms recur in all their former intensity, and the disease goes on rapidly from bad to worse until the deafness is complete.

There are cases of this affection in which there is an entire absence of noise. They generally come on very suddenly, in consequence, often, of some affection of the brain, and are of the most hopeless character, as it respects recovery. It is probable that this variety of the disease is due to paralysis of the auditory nerve.

Nervous deafness is seldom attended with any pain in the ear or the surrounding parts. The patient, in addition to the noises already described, often complains of a sense of fulness in the organ, or a feeling as if the auditory tube had been stopped up with water; but, as to actual pain, he does not experience any, except occasionally, as an intercurrent and adventitious circumstance. The general health is variable. In many cases it is impaired, perhaps, very materially, at the moment of the attack; but in some it is apparently as perfect and vigorous as it ever was. Some of the very worst examples of nervous deafness that I have ever witnessed occurred in persons of this description. The period which intervenes between the commencement of the first symptoms and the occurrence of complete deafness varies from a few weeks to a number of years. Occasionally the individual is able to hear more or less all his life, especially if he uses an ear-trumpet.

The ear, in nervous deafness, often retains its normal appearance most perfectly. The secretion of cerumen proceeds as before, and there is not the slightest evidence of disease in the membrane of the tympanum. Sometimes, however, there is a total absence of wax, and then the drum is not only unusually dry, but more or less opaque. When touched with a probe, it is often found to be remarkably sensitive, as is the case also frequently with the parts immediately around.

Among the thousand and one remedies that have been recommended, from time to time, for the relief of nervous deafness, there is not one which is worthy of the slightest reliance in a curative point of view. I have myself so seldom derived any benefit from the various means that have suggested themselves to my mind, in the treatment of this affection, that I have long been induced to look upon it as being generally altogether irremediable; and in this sentiment most surgeons must, I am sure, fully coincide. Whatever benefit results is usually of a transient character, and is due, in great measure, if not wholly, to the effects which our remedies exert upon the condition of the general health rather than to any improvement in the ear itself. The misfortune is that, in most cases, the affection is entirely neglected in its earlier stages, at a time when treatment might, perhaps, be of service. The patient, thinking that it is a matter of little moment, and that it will gradually vanish of its own accord, feels little inclined to apply for advice, and the consequence is that, when his fears become excited, it is generally too late to do him any good. When the disease supervenes suddenly, and in its more decided forms, I believe that no remedies, however judiciously employed, will be of any avail. All experience goes to show that such cases are generally hopeless. Under opposite circumstances, however, it is always proper to institute as rational a course of proceeding as our limited powers of observation will admit. Looking upon the disease as being commonly of an inflammatory origin, and, therefore, as likely to produce structural disorder, I believe that the best plan that can be adopted is to put the patient upon a very mild course of mercury, giving from a fourth to half a grain of calomel three times a day, until there is slight soreness of the gums, which should be diligently maintained for a number of weeks, without any risk of salivation. If plethora exist, recourse may be had to active purgation, leeching behind the ears, and even general bleeding, along with light diet, and an issue in the neck, or, what is better, a small issue over each mastoid process. If, on the other hand, there is evidence of general debility, as happens in a plurality of such cases, the mercury must be combined with tonics, as iron and quinine, a nutritious diet, the shower-bath, and daily exercise in the open air, with saline ablutions and dry frictions. I place great confidence in the use of mercury in this disease, particularly in its earlier stages, from its salutary effect in preventing structural change. When the lesion is fully established, I have never experienced any benefit from it, and have, therefore, ceased to prescribe it.

In regard to direct applications, it is impossible to observe too much precaution. When there is opacity of the membrane of the tympanum, the affected surface may be gently touched, once a day, with a little dilute mercurial ointment, or a solution of nitrate of silver, in the proportion of half a grain of the salt to the ounce of water. Another appropriate remedy is glycerin with a small quantity of spirits of camphor. Whatever substance be employed, care must be taken that it acts merely as a sorbefacient, and not as an irritant; otherwise serious mischief may ensue.

The treatment of nervous deafness by the introduction of the vapor of nitrous ether into the cavity of the tympanum, through the Eustachian tube, is, I believe, no longer employed by any sensible practitioner, notwithstanding the high encomiums that were formerly lavished upon it by Kramer and other professed aurists. From personal experience with the remedy I was led, long ago, to regard it as one of the delusions of surgical practice; a conclusion fully verified by the later observations of others. Of electricity and electro-galvanism, as means of relieving nervous deafness, I need not say anything here, as experience has shown that they are of no benefit.

b. DEAFNESS FROM DISEASE OF THE TYMPANUM AND OTHER CAUSES.

Besides the form of deafness now described there are others, some of which are transient and curable, others permanent and irremediable. In order to appreciate their character, it will be necessary briefly to inquire into their causes. These will be found to be both numerous and diversified.

1. Deafness is often produced by *destruction* of the membrane of the tympanum, either as an effect of ulceration, of a wound, or of the contact of some acid, introduced by design or from mischief. When the lesion is considerable, it is necessarily accompanied by the loss of the small bones, and by the annihilation of the sense of hearing. Injuries of the skull and brain are occasionally followed by deafness, sometimes partial, at other times complete. This effect is most liable to supervene upon injuries of the base of the cranium, especially such as are attended with fracture of the petrous portion of the temporal bone and laceration of the meninges of the brain; but it may also take place when the lesion is seated upon the side and top of the skull, and when it is apparently of a more trivial character. A severe box upon the ear or temple has been known to cause permanent deafness.

2. Mere *concussion* of the membrane of the tympanum sometimes produces deafness. I have seen several cases where it was caused by the discharge of a

cannon, a gun, or even a pistol. Artillerymen are occasionally, in an instant, deprived of the faculty of hearing during the progress of a battle, or the firing of a salute, from the sudden and violent agitation of the air. Under such circumstances, indeed, it is not uncommon to notice a considerable flow of blood from the ear.

3. *Caries and necrosis* of the temporal bone are a frequent source of deafness. The same effect may be induced by the pressure of a tumor upon the nerve of the ear, the long retention of hardened wax, the pressure of a foreign body upon the membrane of the tympanum, the deposit of lymph, or tubercular matter in the middle cavity of the ear, and occlusion of the Eustachian tube.

4. Violent *sneezing and coughing* have been known to produce deafness. Of the truth of this fact there can be no question, as several well-authenticated cases of it are upon record.

5. Another cause of deafness is frequent washing of the head in *cold water*, cutting of the hair very close in cold weather, or exposing the head, especially when the body is overheated, to currents of cold air.

6. The inordinate use of *quinine* has occasionally caused complete and irremediable deafness in a few hours. Of this occurrence numerous cases are to be found among the inhabitants of our Southern States, where this article is often given in enormous doses.

7. Deafness is sometimes produced by *worms* in the alimentary canal, the repulsion of cutaneous disease, and the suppression of habitual discharges. Lauzani mentions the case of a woman who suffered from deafness during four successive pregnancies.

8. Loss of hearing may be occasioned by effusions upon the base of the *brain*, whether the result of traumatic causes, tuberculosis, or common inflammation.

9. Deafness is sometimes dependent upon *malformation* or disease of the internal ear. Cases occur in which there is no trace whatever of the vestibule, cochlea, and semicircular canals. Occasionally the labyrinth is composed of a single cavity, shut off entirely from the tympanum, as in the crustaceous animals. Finally, the internal ear is sometimes occupied by scrofulous matter, serum, fibrin, or a substance resembling chalk.

10. The cause of deafness may reside in the cavity of the *tympanum*, which may be filled up with various kinds of materials, as mucus, lymph, pus, and blood, interfering with the transmission of sound. A substance resembling tubercle, and consisting of granules, epithelium, and oil globules, has been found in this portion of the ear, the occurrence being most common in young subjects of a scrofulous predisposition. Finally, the cavity of the tympanum may be absent; and there are cases in which there is imperfect development of the small bones of the ear.

11. *Necrosis* of the bony structures of the internal ear is necessarily followed by complete destruction of the function of audition. In the case from which the annexed cut, fig. 226, was copied, the necrosis involved the whole of the cochlea, vestibule, and semicircular canals, and gave rise to the most violent inflammation of the brain, with paralysis of the face, arm, and leg, and total deafness on one side.

Fig. 226.

Necrosis of the internal ear.

12. There may be lesion of the *auditory nerve;* consisting either in imperfect development, interstitial deposits, induration, softening, paralysis, or compression by osseous and other matter.

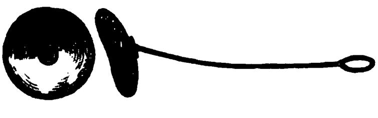
13. Deafness may be occasioned by lesion of the *mastoid process*, the cells of which are lined by a reflection of the mucous membrane of the middle ear, and which are, therefore, liable to the same kind of diseases. Inflammation, whether traumatic or idiopathic, may lead to various changes in this supplemental portion of the ear, all more or less prejudicial to audition. It is also liable to malformations, obliteration, and scrofulous deposits.

14. Finally, deafness, partial or complete, may be caused by enlargement of the tonsils, by polyps of the nose, and by various affections of the fauces.

It is not necessary to enter into any formal disquisition respecting the *treatment* of these various kinds of deafness. Their chief interest consists in their diversity, and the consequent necessity of inquiry into their character before we attempt their removal by the use of remedies. Some of them, from their very nature, are incurable; others, for the same reason, hold out a prospect of relief by judicious treatment; and not a few will disappear spontaneously, or simply by the operation of time.

When the deafness depends upon the loss of the drum of the ear, the hearing may often be greatly improved by an artificial substitute, fig. 227, consisting of a circular or oval piece of very thin India-rubber, as originally suggested by Mr. Toynbee. It is attached to a very delicate wire rod, a little more than an inch in length, and may be very easily introduced and withdrawn by the patient himself. It should be worn at first for a few hours only a day, and then not in contact with the remnants of the tympanic membrane, lest it should occasion irritation. It is always removed at night, and the ear syringed twice a day if there is any discharge. When no such contrivance is at hand, great comfort and advantage will be derived from the use of a little pellet of cotton-wool, moistened with glycerin, and inserted into the ear, in contact with the aperture at its bottom. Substitution may be effected several times, daily, according to the amount of discharge.

Fig. 227.



Toynbee's artificial tympanic membrane.

SECT. VI.—DISEASES OF THE EUSTACHIAN TUBE.

The Eustachian tube, which establishes a direct communication between the middle ear and the fauces, is liable to various affections, which influence, to a greater or less extent, the function of audition. These affections may be thus enumerated: 1. Congenital occlusion. 2. Inflammation. 3. Mechanical obstruction. 4. Stricture.

1. Congenital *occlusion* of the Eustachian tube is probably more frequent than is generally imagined. It is similar to the malformation which is met with in some of the other mucous outlets of the body, as the anus, urethra, and vagina, and may affect the entire canal, or be limited to a particular portion. In the latter case, the obstruction is caused either by a small membrane, not unlike a hymen, or by the presence of fibrous, fibro-cartilaginous, or cartilaginous tissue. However induced, it is generally, if not always, a cause of deaf-dumbness, and is beyond the reach of relief.

2. The Eustachian tube, being lined by a reflection of the mucous membrane of the fauces, is liable to *inflammation* and its various consequences, as thickening, ulceration, and even gangrene. Scrofulous children, affected with chronic disease of the tonsils, are particularly prone to suffer in this way. The inflammation of the fauces often continues for years, being constantly subject to exacerbations from the slightest exposure to cold, derangement of the digestive organs, and whatever has a tendency to excite and maintain general debility. The membrane, from this habitual congestion, becomes gradually indurated and thickened from interstitial deposits, and thus ultimately encroaches very seriously upon the caliber of the tube. Similar effects are often produced in inflammation of the throat consequent upon some of the eruptive diseases, particularly measles, scarlatina, and smallpox. The morbid action thus awakened not unfrequently extends into the Eustachian tube, and thence along the tympanum, where, leading to various deposits and alterations of structure, it may be followed by the worst results.

Ulceration of the Eustachian tube is observed chiefly in connection with constitutional syphilis, attended with destruction of the tonsils and the arches of the palate. Under such circumstances, the membranous portion of the canal may be entirely eroded, followed, during the healing process, by occlusion of the remainder of the passage. Gangrene of the tube is extremely rare.

Inflammation of the Eustachian tube may lead to a deposit of *plastic* matter. Such an event, however, must necessarily be uncommon, but its occurrence has been demonstrated by dissection, and, therefore, admits of no dispute. When the quantity is considerable, it may cause permanent closure of the tube. Of suppuration of this passage very little is known, but the probability is that it is much more common than is usually imagined.

3. Mechanical obstruction of the tube may be caused by the presence of inspissated mucus, fibrin, blood, and earthy matter.

Inordinate secretion of *mucus* is an occasional occurrence in this tube, chiefly, we may suppose, as a consequence of chronic inflammation. When the fluid is very thick, or long retained, it may completely clog up the passage, and thus seriously impair hearing. The occurrence will be more likely to happen when the mucus is intermixed with plastic matter. Fibrin alone may be a cause of obstruction, and so also may be a clot of blood, the result of hemorrhage in the internal ear.

Finally, a substance resembling *chalk*—probably nothing but altered tubercular matter—is sometimes found in the Eustachian tube, closing it either partially or completely, and thus acting as a cause of deafness.

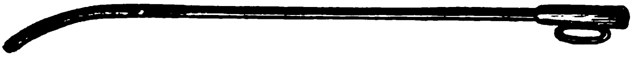
4. *Stricture* of the Eustachian tube is uncommon. It presents itself in various forms and degrees, but has hardly been studied with sufficient care and attention to enable us to give any satisfactory account of it. It generally appears as a small, narrow band, stretched across the tube from one side to the other; or as a ring-like contraction; or, as when it involves the osseous part of the canal, as a species of exostosis, growing inwardly and filling up the conduit. Sometimes the passage is obliterated nearly from one extremity to the other. However constituted, the obstruction is usually permanent, although it may not be complete.

The *diagnosis* of the various affections of the Eustachian tube above described can only be established by means of the catheter, all other attempts at arriving at a knowledge of them being useless. It was formerly imagined that the existence of obstruction, from whatever cause arising, could be determined simply by inflation, by shutting the mouth and holding the nose; it being asserted that if the air did not penetrate the tube, it was an evidence that it was closed. Nothing, however, can be more erroneous; for there are, as is well known, many persons who cannot, by any effort they can employ, distend this passage at all, however clear it may be. I have myself never been able to blow air into my left Eustachian tube, although my hearing is perfect, and the operation always promptly succeeds on the right side. Catheterism, then, is the only reliable means of diagnosis, and it is so much the more valuable, because, while it enables us to obtain important information respecting the nature of the disease, it is one of the best methods of cure.

Catheterism of the Eustachian tube is quite as simple an operation as that of the bladder; but as it demands an unusual amount of practice, as well as a most accurate knowledge of the anatomy of the parts, it is evident that it can never come into general use. Besides, it is an operation which requires great delicacy on account of the exquisite sensibility of the tube, as well as of the surface immediately around. For want of proper care in its performance, serious mischief may be produced.

Different kinds of instruments are in vogue for exploring this canal; some being straight, others curved; some flexible, others inflexible. The one which I have always been in the habit of using, and which will be found to answer the purpose most admirably, is represented in fig. 228. It is composed of silver, and is, consequently, inflexible, being six inches in length, and having a short curve at its distal extremity, with a very smooth probe-pointed orifice. It varies in diameter from the size of a crow quill to that of a small goose quill, according to the age of the patient. In its general outline, it is somewhat conical, and the ring at its large extremity corresponds with the concavity of the curve at the smaller one; an arrangement which is found to be useful in the introduction of the instrument, as it indicates the direction of its point.

Fig. 228.



Catheter for the Eustachian tube.

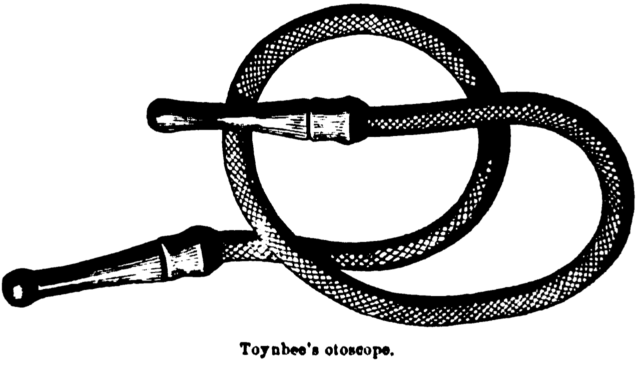
The patient being seated upon a chair with the head thrown backwards against the breast of an assistant, the catheter, properly oiled and warmed, is inserted into the nose, its concavity being directed downwards towards the floor of the nostril, along which it is conveyed until it reaches the fauces. Its point is now turned upwards and outwards, so that the ring of the instrument shall be in an oblique position, while its body shall lie in close contact with the outer wall of the nasal fossa. All that is required now is to pass the catheter gently on, when it cannot fail to reach the tube, its entrance being denoted by a want of resistance, and a feeling as if it moved in a narrow track. The distance to which it may be carried will depend upon its size and upon the presence or absence of mechanical obstruction. Under no circumstances, unless the instrument is uncommonly small, can it be pushed on into the middle ear.

If now, while the catheter is in its position, air be blown through it into the tube, we shall be able to determine, at least in many cases, both the degree and the character of the obstruction. Thus, if the closure is partial, the fluid will readily find its way into the middle ear, very much as when we attempt inflation by shutting the mouth and nose; whereas if it is complete no such effect will follow. The presence of mucus may generally be detected by the peculiar gurgling or rustling sound which the patient perceives as the air rushes past the accumulated fluid; and soon after he will probably be conscious of a diminution of the disagreeable noises which previously disturbed him. If, on the other hand, the obstacle is of a solid nature, the sound produced by the inflation will be indistinct, or similar to that caused by blowing against a bone or other hard body.

Stricture of the tube, from ordinary inflammation, may be suspected when the point of the instrument, after having passed a certain distance, refuses to advance any farther. We may suppose that the obstruction is osseous, calcareous, or gristly, when the resistance is uncommonly great, and the contact of the catheter elicits a sharp noise. The existence of mere deafness, or of various sounds, cannot, considered by itself, be regarded as an evidence of closure of the Eustachian tube, as it is a concomitant of different affections.

Mr. Toynbee, whose vast experience in aural diseases entitles him to speak with the force of authority, employs, as a means of exploring the Eustachian tube, an instrument of his own invention, denominated an otoscope, fig. 229, consisting

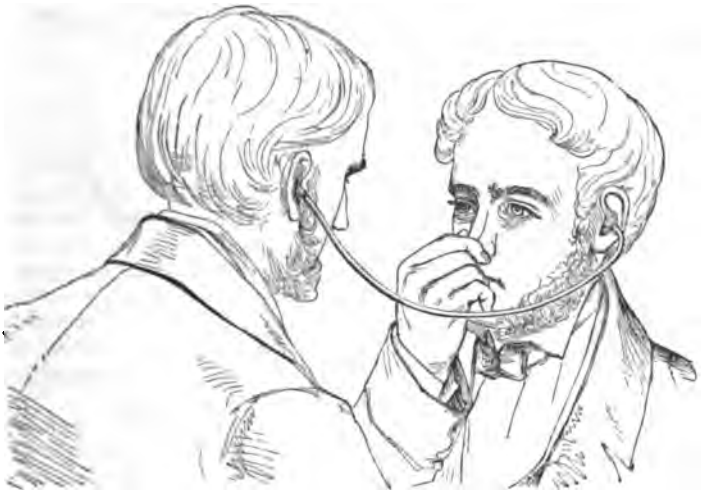
Fig. 229.



Toynbee's otoscope.

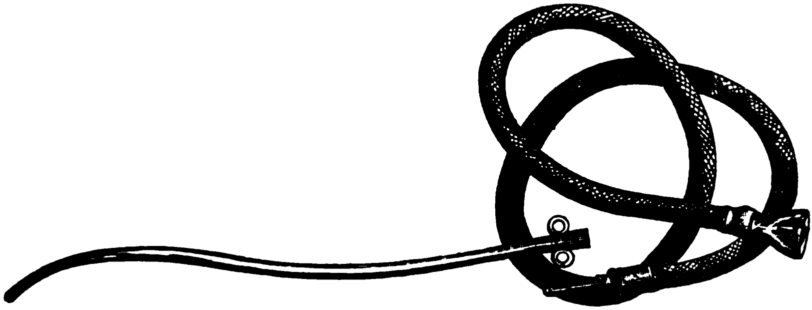
of an elastic tube about eighteen inches in length, each end of which is tipped with ivory or ebony. The manner of using the instrument is exhibited in fig. 230. It will be observed that one extremity rests in the ear of the surgeon, the other in that of the patient. If there is no obstruction of the canal, the surgeon will distinctly perceive a faint crackling sound, produced, apparently, by a slight vibratory movement of the tympanic membrane, when the patient makes a full and rapid expiration, or attempts to swallow his saliva, no such effects following when there is serious or complete occlusion. When there is thickening of the mucous lining of the tympanic membrane, the noise heard during the examination will occasionally resemble a gentle flapping, although the Eustachian tube may be perfectly pervious.

Fig. 230.



Application of the otoscope.

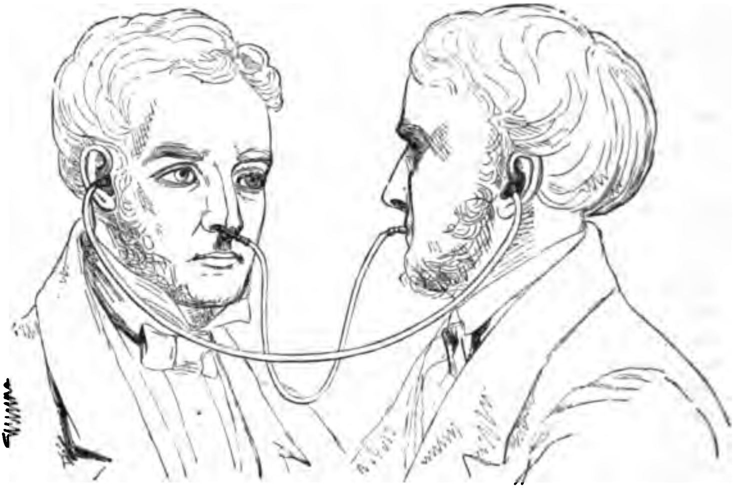
Fig. 231.



Ear explorer.

Direct exploration of the canal is effected by Mr. Toynbee by means of a common Eustachian catheter and an elastic tube, eighteen inches in length, one end of which has a flat mouth-piece of ivory, with a few deep notches in it, while the other is provided with a small steel nozzle, adapted to the further extremity of the catheter, which is not quite as large as an ordinary crow quill. The catheter having been inserted into the Eustachian tube in the usual way, the surgeon holds it with the left hand, and places one end in his mouth, and the other in the catheter, grasping it also with the left hand. With his right hand thus at liberty, the surgeon now takes the otoscope and introduces one end of it into the ear of the patient, who may hold it there, the other end being held by the surgeon in his own ear; or the tube may be made so tight as to remain there without being held, leaving the operator's right hand still free, as exhibited in fig. 232.

Fig. 232.



Mode of examining the ear.

The apparatus being thus adjusted, the surgeon blows very gently into the explorer, and at the same time listens attentively through the otoscope to ascertain whether the air enters the ear, and, if so, what sound it produces. If the tympanum is free, the air will rush into it in a clear stream; if, on the other hand, mucus be present, it will cause a peculiar gurgling, replaced by a squeak or bubbling sound, if there is, in addition, thickening of the lining membrane.

Catheterism of the Eustachian tube is an important means of *treatment* in affections, not only of the canal itself, but of the middle ear, whether arising from mere thickening of the investing membrane, or accumulation of mucus. In the former case, the mere contact of the instrument often produces an excellent sorbefacient effect, at the same time that it aids powerfully in the removal of the morbid sensibility of the tube, which is so generally present in inflammation. The operation may be repeated, at first, once every fourth day, and afterwards every twenty-four hours, the instrument being retained several minutes each time. It may be assisted by the inflation of air from the operator's mouth, or, after the withdrawal of the catheter, by the patient's own efforts.

When more direct medication is required, the object may be attained by the injection of tepid water, slightly impregnated with some astringent article, as sulphate of zinc or acetate of lead. Great care must be taken that the solution is as mild as possible, otherwise much harm may result. A better remedy than either of these is nitrate of silver, in the proportion of about an eighth of a grain to the ounce of water. Whatever substance is used, the injection should not, on an average, be repeated oftener than once every third or fourth day.

Along with these means, special attention should be paid to the general health; the diet properly regulated, the bowels maintained in a soluble condition, and a free discharge kept up behind the ear by means of an issue. When the disease is obstinate, and fairly attributable to the effects of inflammation, benefit may be derived from slight and steadily continued ptyalism.

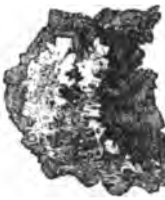
Deafness caused by permanent occlusion of the Eustachian tube was formerly treated by perforation of the membrane of the tympanum. The operation, proposed early in the present century by Sir Astley Cooper, was at one time much in vogue, although it is now obsolete. The object was to drill a small opening into the membrane of the tympanum, in order to admit air into the middle ear, the absence from which, as was alleged, was the principal cause of the want of hearing. Subsequently, as the aperture thus made was found to have a tendency soon to close, thereby frustrating the intention of the operation, an instrument was devised for cutting out a circular piece of the membrane. I had occasion, early in my professional life, to give this procedure a very fair trial in several instances, but as no benefit whatever resulted, I have not since repeated it; nor can I find any well authenticated case upon record in which it was of any permanent service.

SECT. VII.—AFFECTIONS OF THE MASTOID CELLS.

Disease of the mastoid cells occurs chiefly in young strumous subjects, in consequence of attacks of cold, measles, scarlatina, and smallpox. It is rarely met with after the twentieth year, and then mainly as an effect of external violence. Manifesting itself originally as an inflammation of the lining membrane, it may, in its progress, gradually extend to the osseous structures, on the one hand, causing caries and even necrosis; and, on the other, to the brain and its envelops, eventuating in abscess of the former, and in thickening and effusions of the latter. In the milder varieties of the disease, which is much oftener chronic than acute, there is, generally, simply an opaque, thickened, and vascular state of the lining membrane, with an abnormal secretion of mucus, to which, when the inflammation is more severe, is frequently superadded a deposit of pus. In the latter case, especially when the matter does not find a ready outlet through the wall of the auditory tube or the tympanic membrane, suppuration is liable to occur in the lateral sinus, in the brain, and in the arachnoid and pia mater, the morbid action being propagated along the veins of the mastoid cells. In children before the third year, the cerebrum is most prone to suffer from abscess from this cause, owing to the imperfectly developed condition of these cells, and their close proximity to this portion of the cerebral hemisphere; but, at a later period, when these cavities are pretty fully formed, the mischief is generally seated in the cerebellum and its more immediate investments. This distinction, first clearly pointed out, I believe, by Mr. Toynbee, is practically interesting, and therefore worthy of recollection. When the mastoid process becomes involved, the disease, which may ultimately extend to the petrous portion, if not, at times, also to the squamous, may manifest itself simply as caries, or as caries and necrosis, according to the nature and violence of the morbid action.

In the adjoining cut, fig. 233, from Wilde, the whole of the mastoid process, together with a large piece of the petrous portion of the temporal bone, the posterior wall of the middle ear, and one of the semicircular canals, was removed from a child three years old.

Fig. 233.



Necrosis of the mastoid process and petrous portion of the temporal bone.

The matter which forms in disease of the mastoid cells, whether it be limited to these cells, or found also in the lateral sinus, cerebrum, cerebellum, pia mater, or arachnoid membrane, is either of the nature of ordinary pus, or, as not unfrequently happens, is strictly of a strumous character, and often quite offensive. In the lateral sinus it is frequently associated with clotted blood.

Collections of pus in the mastoid cells either destroy life by cerebral irritation, or by the induction of inflammation and abscess in the brain and its envelops; or, if the patient survives, they may find a partial vent, by ulcerative action, through the auditory tube or tympanic membrane. More rarely, the fluid is discharged externally along an opening in the mastoid process. Death occasionally occurs, in this disease, from pyemia or purulent infection, as in the interesting cases related by Abercrombie, Watson, Wilde, Bruce, and others.

The *symptoms* of inflammation of the mastoid cells are not always characteristic, as the disease is liable to be confounded with inflammation of the middle ear and of the auditory canal. In general, it will be found that the patient has been laboring for some time past under otalgia, or aural discharge, probably consequent upon some eruptive fever, and that he bears the marks of dilapidated health, or of strumous disease. The pain, which is often excessive, is referred to the mastoid process or occipital region, both of which are extremely tender on pressure; the individual is feverish, thirsty, and restless; there are buzzing noises in the ear; the head is dizzy and aches violently; and delirium usually sets in at an early stage, always followed, when matter forms, by rigors and coma, if not also by convulsions, especially if there is grave cerebral involvement. Signs of suppuration frequently appear in the auditory canal, even when the pus of the mastoid cells makes no effort to escape by that route or by the drum of the ear, both of which, however, invariably show signs of inflammation at an early period of the attack, the former being red and swollen, the latter injected and opaque.

The *treatment* of inflammation of these cavities must be conducted antiphlogistically. Leeches and counter-irritation by blisters, with anodyne fomentations, light diet, irritating purgatives, and the antimonial and saline mixture, are the most reliable remedies. In chronic cases, marked by a strumous taint, an issue in the nape of the neck, and the judicious use of quinine and iodide of iron, will be likely to prove beneficial. A gentle course of mercury, especially in the form of the bichloride, should be tried when the disease is unusually obstinate. When the brain is endangered by an extension of the morbid action, the tympanic membrane should be freely punctured, and the mastoid process promptly opened, to afford vent to the pent-up fluid, which is generally the direct cause of the cerebral mischief and of the carious or necrosed condition of the bone.

SECT. VIII.—OTALGIA.

Pain in the ear or ear-ache is of very frequent occurrence, especially in children and young persons, and may arise from a great variety of causes, as exposure to cold, inflammation of the membrane of the tympanum or of the auditory tube, gout and rheumatism, disorder of the digestive organs, and affections of the teeth. Sometimes it is of a purely nervous or neuralgic character, coming and going in regular paroxysms, like neuralgic pain in other parts of the body. Children, especially such as are of a delicate constitution, are very obnoxious to severe attacks of ear-ache from exposure to cold. The suffering usually comes on in the evening, and is generally aggravated by recumbency, so that the patient is obliged to get up and walk the room, or, if he is a child, has to be supported in his nurse's arms. Ear-ache, often of a very distressing character, is a common attendant upon measles and scarlatina; and under such circumstances, as well as in many others, the probability is that it is merely a symptom of ordinary inflammation of some of the structures of the ear. What corroborates this view is the fact that the tympanum and auditory tube usually afford evidence of the morbid action, the former being red and injected, while the latter is exquisitely tender, and the seat of an inordinate secretion of cerumen.

Neuralgia of the ear is most common in children, although it may occur at any period of life, and under circumstances apparently the most opposite. Its causes are various, being sometimes purely local, at other times constitutional, while in a third series of cases they are of a mixed character. During my residence in Kentucky, where neuralgia, in all its forms, is exceedingly common, I met with several cases of this affection, which were unquestionably of a miasmatic origin. The paroxysms observed the same regularity as those of intermittent fever, recurring once in the twenty-four hours, or once every other day, lasting for some time, and then gradually disappearing; being generally preceded by chilly sensations, or even by a severe rigor, followed by a copious sweat, and promptly relieved by the ordinary antiperiodic remedies.

In the *treatment* of otalgia it is a matter of primary importance to obtain, if possible, a clear idea of the nature of the exciting cause, as upon a knowledge of this must depend the choice of our remedies. If the teeth are at fault they must be extracted, or, at all events, put in order, before we can reasonably hope for a subsidence of the local distress; and the practitioner who does not inquire into the condition of these organs, in such cases, altogether neglects his duty. The removal of a carious tooth is often followed by instant relief, and a permanent cure. When the attack has been caused by exposure to cold, the most efficient treatment consists in a hot foot-bath and a full dose of Dover's powder, along with warm drinks and warm applications to the ear. From three to twelve drops of laudanum, according to the age of the patient, should be introduced, tepid, into the affected organ, where it should be retained by means of raw cotton and a proper position of the head. When the distress is very violent and the ordinary remedies fail, leeches should be applied behind the ear, and the bowels opened by a brisk cathartic, followed by an efficient diaphoretic.

In the neuralgic form of the disease, the best remedy is quinia, either alone or in union with strychnia, arsenious acid, and morphia. Colchicum will be of service when the affection is dependent upon gout or rheumatism.

CHAPTER VII.

DISEASES AND INJURIES OF THE FRONTAL SINUS.

The affections of this cavity may be said, in general terms, to resemble those of the maxillary sinus and of the nose. The most important are inflammation, abscess, fractures, foreign bodies, polyps, hydatids, and encephaloid; but, owing to their great infrequency, their diagnosis is generally very difficult, and their treatment unsatisfactory.

1. *Inflammation* of the frontal sinus may be provoked by external injury, as a fall or blow on the forehead; but, in general, it is caused by the effects of tertiary syphilis, or by an extension of disease from the nose by continuity of structure through the Schneiderian membrane. However induced, it is characterized by a sense of weight and fulness, and by a dull, heavy, aching pain along the eyebrow, accompanied, in most cases, by sneezing and a discharge of watery mucus from the nose, with lachrymation and suffusion of the eye, more or less cephalalgia, and other evidences of indisposition, such as attend the more severe forms of coryza. An unusual amount of mucus is no doubt poured out into the sinus, and when the inflammation is at all severe, this, acting obstructingly, or not finding a ready outlet, may seriously aggravate the patient's suffering.

The treatment must be by leeching over the affected sinus, active purgation, and diaphoretics; aided, as the morbid action declines, by sternutatories with a view to their revulsive effect upon the mucous membrane of the nose.

2. When the inflammation passes into *abscess*, the occurrence will be denoted by an increase of the local suffering, the pain assuming a throbbing, tensive, pulsatile character, and by excessive headache, delirium, and rigors, followed by high febrile disturbance. The forehead and eyebrow are swollen and tender, and, if the matter does not soon find an outlet, an erysipelatous blush will appear upon the surface, an almost unerring sign of the nature of the disease. If the case is misunderstood, or improperly treated, the morbid action may extend to the brain, or cause caries or necrosis of the walls of the sinus, as occasionally happens when the abscess is the result of tertiary syphilis.

The pus may find an outlet through the nose, or through the anterior wall of the sinus, though such an event must necessarily be extremely uncommon. Occasionally, as when the quantity is unusually great, it passes into the other sinus, by breaking down the intervening septum. When it flows off by the nose the patient is apprised of the fact by the use of his handkerchief.

The treatment must be conducted according to the ordinary principles of practice. If the case is urgent, as indicated by the cerebral disturbance and the erysipelatous condition of the forehead and eyebrow, the soft structures should be freely divided and a small opening made, by means of a suitable trephine, into the most dependent part of the sinus, which may afterwards, if necessary, be injected with anodyne and detergent lotions to promote the cure.

3. *Fractures* of this cavity are uncommon. They may be caused by falls, blows, kicks, or gunshot, and may, therefore, be either simple, compound or comminuted. A curious phenomenon occasionally witnessed in these accidents is an emphysematous condition of the scalp, face, and eyelids, produced by an escape of air from the nose into the connecting areolar tissue. The injury, whatever may be its character, must be treated upon the same general principles as fractures in other parts of the skull. When the outer table is depressed, so as to occasion serious disfigurement, elevation must be attempted, either with the lever alone, or with this instrument and the trephine. Loose splinters and any foreign matter that may be present should, of course, be promptly and thoroughly removed.

4. The frontal sinus is occasionally the receptacle of *foreign bodies*, either formed within, or introduced from without; more generally the latter. Thus, Bartholin speaks of having met with earthy concretions, similar to those which are sometimes found in the nose. Several authors assert that they have seen worms in it, the number, in one case, exceeding seventy; their development having doubtless been due to larvæ deposited in the nose, whence the maggots crept into the frontal sinus. The annals of surgery supply us with a number of examples of the lodgment of balls in this cavity in cases of gunshot wounds; and there are also several instances on record where the end of a knife-blade or scissors, broken off in its passage through the skull, was arrested in it.

The presence of a foreign body in this situation must necessarily be productive of pain, a sense of weight and fulness, and probably also more or less tumefaction in the forehead and eyebrow. No diagnostic value can, however, be attached to these symptoms. When the foreign body has been introduced from without, the nature of the case may easily be determined, simply by its history.

The proper remedy in these cases is, of course, extraction, a suitable opening being made into the anterior wall of the sinus by means of a trephine.

5. *Polyps*, of a gelatinoid or fibrous structure, are sometimes developed in the frontal sinus, or extend into it from the nose, forcing apart its walls, and causing more or less pain and deformity, but affording no pathognomonic signs. In time the overlying bone becomes softened and attenuated by the pressure of the tumor, crackling under the finger like parchment. Viallet and Rouger met with a case in which a polyp of the frontal sinus was associated with an exostosis of this cavity; and several instances have been recorded in which a tumor of this kind coexisted with a similar formation in the nose and maxillary sinus. Removal is effected with the knife and gouge, a crucial incision being made through the integuments of the forehead so as to admit the surgeon's finger and instruments.

6. Langenbeck and Brunn have each recorded the particulars of a case of what they call *hydatids* of this sinus, but which, I suppose, were really nothing but serous cysts. The tumor during the progress of its development encroaches upon the forehead and roof of the orbit, pushing the eye forward and downward, and thus occasioning serious deformity. The diagnosis must necessarily be obscure. As the disease advances, however, the anterior wall of the sinus will be rendered so thin as to yield under the pressure of the finger, and admit of the detection of fluctuation. In doubtful cases important information might be elicited by the exploring needle. The proper remedy is excision.

Robert Keate, in 1819, published, in the tenth volume of the London Medico-Chirurgical Transactions, the particulars of a case of so-called hydatids of the frontal bone, in a girl eighteen years old, but the tumor seems to have been developed in the areolar texture, and not in the sinus, which, however, became accidentally involved during the progress of the disease.

7. *Encephaloid* of the frontal sinus is probably more common than is generally

imagined. I have myself seen only one case of it. The patient was a gentleman, upwards of sixty years of age, who, twelve months previously, had been seized, without any assignable cause, with what he supposed to be an attack of erysipelas of the forehead and face. On recovering from this, he noticed an unusual fulness over the left eyebrow, attended with great hardness and excessive pain. The lids continued to swell, and the left nostril, by degrees, became obstructed and the seat of a thin, sanious discharge, more or less profuse, and, at times, quite fetid. At length several openings formed upon the most prominent part of the tumor, giving vent to thick, yellowish pus, and readily admitting of the passage of a probe into the nose. Upon enlarging these openings, the sinus was found to be occupied by a soft, fungous mass, the overlying bone being softened and disintegrated. The morbid growth presented all the characteristics, physically and microscopically, of encephaloid. The patient passed out of my hands in a few weeks, and died soon after, completely exhausted.

Of *scirrhus*, *colloid*, and *melanosis* of the frontal sinus the annals of surgery do not, so far as I know, afford a solitary example.

CHAPTER VIII.

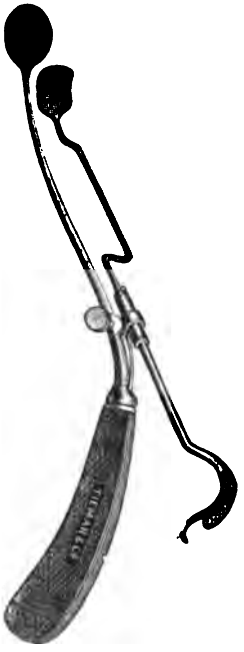
INJURIES AND DISEASES OF THE NOSE AND ITS CAVITIES.

The nose is subject to various affections. The most common are hemorrhage, ulceration, polyps, hypertrophy of the mucous membrane, certain malformations, and foreign bodies.

For examining the anterior portion of the nasal cavity, the best instrument is the bivalve ear speculum, delineated at p. 298. The patient should be seated upon a chair, with the head thrown well back, in order that the light may readily penetrate the nares. If the sun is not sufficiently bright, the inspection may be conducted with the aid of a wax taper, or, what is better, a suitable reflector.

The examination of the posterior nares and the adjacent parts may be very satisfactorily conducted with the *rhinoscope*, delineated in fig. 234, and devised by Dr. Simrock, of New York. It consists, as the drawing indicates, of two branches, one of which terminates in a speculum, while the other runs out into an oblong, concave spatula for raising the soft palate. When the instrument is properly adjusted, it is easy to obtain a very good view of the back part of the nasal cavities, the orifices of the Eustachian tubes, and the posterior aspect of the velum. A strong light is, of course, required, and it need hardly be added that that of the sun is the best; but in cloudy weather, and at night, the object may very readily be attained by means of gas-light thrown into the fauces with a strong concave reflector. The great advantage of this instrument is its simplicity, and the fact that it may be managed with one hand, thus leaving the other free for the application of remedies.

Fig. 234.



Dr. Simrock's rhinoscope.

Rhinoscopy was first practised by Bozzini, in 1807;

but it was almost forgotten until it was revived by Czermak, who has devised various useful instruments for its successful performance.

1. *Hemorrhage.*—The mucous membrane of the nose, from its great vascularity, is a frequent seat of hemorrhage. The exciting cause may be external violence, as a blow, with or without fracture of the nasal bones, or mere plethora of the system, nature endeavoring to find a spontaneous outlet for the redundant fluid. Young persons, of both sexes, are particularly prone to this discharge about the period of puberty. Occasionally the flow is vicarious of the menstrual flux. The amount of bleeding varies in different instances, from a few drachms to a number of ounces. In the latter case, and especially when the discharge is of frequent recurrence, excessive debility, and even loss of life, may be the result, as I have witnessed in not less than three instances. The blood generally proceeds from one nostril only; very rarely from both. In the milder cases, it probably emanates in great measure, if not entirely, from the inferior portion of the nasal septum.

The milder forms of nasal hemorrhage require no special interference; nor does the practitioner interpose his authority when the discharge is vicarious, or an effort of nature to rid the system of an undue supply of blood. It is only when the discharge is very abundant, or slight, yet so frequent in its recurrence as to tend to injurious consequences, that an attempt should be made to suppress it. With this view perfect quietude of mind and body is enjoined, the head and shoulders are thoroughly elevated, and all stimulants, whether in the form of food or drink, are interdicted. A large bladder, partially filled with pounded ice, or a refrigerating lotion, is applied to the head and nape of the neck, and a lump of ice, enveloped in flannel, to the nose. Sometimes a small piece of ice may advantageously be inserted into the affected nostril, or held against the roof of the mouth. Along with these means the patient takes, every three hours, two grains of opium and two of acetate of lead, until the system is fully impressed with the narcotic, when it may be either entirely suspended, or administered in smaller quantities, and at longer intervals. One of the most important indications, in this and all other hemorrhages, is to quiet the heart's action, and there is no medicine so well calculated to do this as opium. To produce the desired effect it should be given in full doses, repeated from time to time as circumstances may require. When there is reason to believe that there is a want of coagulability of the blood, the best remedies will be perchloride of iron, or, what I like equally well, the tannate of that metal, the dose of the former being three grains, and of the latter, five or six, every three or four hours. The bowels are, of course, not neglected; and when the bleeding is connected with, or dependent upon, actual plethora, blood is freely taken from the arm, on the principle of derivation and direct diminution of vascular supply. Hot pediluvia, diaphoretics, and vesication of the neck are sometimes eminently serviceable. In a very obstinate case of epistaxis, resisting almost every conceivable measure, even plugging, Dr. Davenport, of Iowa, promptly arrested the hemorrhage by the injection of a quantity of the undiluted perchloride of iron.

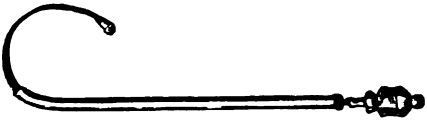
In the milder forms of epistaxis, relief may sometimes be promptly obtained by pressing with the index and middle fingers the ala of the nose forcibly against the nasal septum, especially when, as not unfrequently happens, the blood proceeds from the inferior portion of that structure. The compression should be steadily maintained for at least half an hour, the head being in the meanwhile strongly inclined forwards, and care taken, when the fingers are removed, not to blow the nose for fear of detaching the clot.

When the above measures fail, or when as much blood has already been lost as the system can bear, direct interference by obstructive means is required, and that without delay. The patient being supported upon the edge of the bed in the semi-erect posture, a double wire, very thin and flexible, and composed either of silver or iron, is passed along the floor of the nostril into the fauces, where it is to be seized with the finger introduced into the mouth. A strong double ligature, tied over a piece of soft sponge, or a roll of cotton, charpie, or patent lint, is then secured to the loop, and drawn up into the nose by retracting the wire.

The finger being still in the mouth assists in carrying the tampon round the palate and in adjusting it in the posterior orifice of the naris. The wire is now detached, and the operation completed by tying the ends of the thread over another plug in front. Both outlets being thus effectually occluded, the hemorrhage must necessarily cease as soon as the nasal cavity is filled with blood, which thus serves to compress and control the bleeding vessels. The parts are not disturbed until the end of the third day, when the tampons are removed, and the nasal cavity washed out with some mildly astringent lotion, introduced with the syringe.

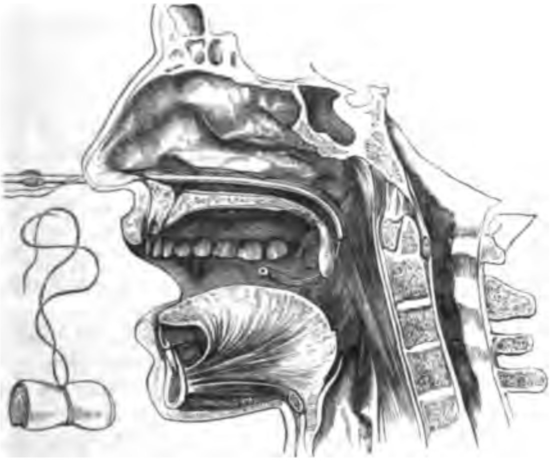
When no wire is at hand, the operation of plugging the nose may be performed with a gum-elastic catheter, a piece of whalebone, or a stick of wood; in fact, with almost anything. The best contrivance, however, of all, is that represented in fig. 235, and known as Bellocq's instrument. It consists of a silver tube, about six inches long, containing a movable rod of nearly the same length, with a steel spring surmounted by a silver knob, with a hole in the centre for the attachment of the ligature which holds the posterior tampon. The instrument is one of the most perfect imaginable, and should find a place in every surgeon's armamentarium. Fig. 236 exhibits the manner of applying it.

Fig. 235.



Bellocq's canula.

Fig. 236.



Plugging of the nose.

With any of the means now described the operation in question may always be promptly and safely performed, and the practitioner who allows his patient to bleed to death from such a cause should, provided he has had a fair opportunity of exerting his skill, be held personally responsible for his life. I have seen one man, full of health, and in the prime of existence, perish from nasal hemorrhage, which might have easily been arrested by this simple procedure.

Care must be taken after this operation that the plugs are not retained too long, as they would be a source of irritation and mischief, provoking the formation of matter, which would soon become excessively offensive, tainting the atmosphere, and poisoning the system. I have seen several cases where, from this cause, the patient lost his life, being seized with a low form of fever, attended with delirium, which nothing could arrest. In one of the cases there were marked symptoms of pyemia. To prevent these mishaps the plugs should be withdrawn at the end of forty-eight hours, and the nostrils well syringed with some mildly detergent and deodorizing lotion, when, if necessary, substitution should be effected. When there is much discharge a daily renewal of the dressings may be proper. It is impossible to direct too earnest attention to this subject. The late Professor Colles, of Dublin, is said to have met with a case in which the presence of a plug in the posterior naris excited tetanus.

Sometimes the hemorrhage may be promptly and effectually arrested by plugging the nostril with a piece of sheep's intestine, filled with water, the fluid being introduced after the insertion of the tube, so as to make firm and equable pressure upon the bleeding surfaces. This treatment, first suggested, I believe, by Mr. Green, of London, has the advantage of admitting of the frequent injection of cold water, until all disposition to hemorrhage has ceased. Garriel recommended, in 1850, with a similar view, a tube of caoutchouc, inserted into the nose, and filled by insufflation. By carrying the tube back into the fauces, it will form an effectual obturator for the posterior naris.

The removal of the plug may generally be easily effected by means of a female catheter or grooved director, passed along the floor of the nostril, a pair of polyp forceps being previously introduced into the mouth to seize the foreign body the moment it is detached. Such a precaution is eminently necessary, otherwise the plug, having lost its hold, might fall upon the epiglottis, and thus instantly produce suffocation.

2. *Ulceration.*—Ulcers of the nose, chiefly of a strumous and syphilitic nature, are sufficiently common, and from their rebellious character and fetid discharge, are often a source of great annoyance, both to the patient and practitioner. Seated originally in the mucous membrane, they gradually extend in depth, until, in many cases, they involve all the component structures, cartilage and bone, as well as fibrous tissue. The disease generally commences high up in the nose, beyond the reach of the eye of the observer; but not unfrequently its first effects are displayed upon the inferior turbinated bone, or the nasal septum. In the strumous variety one side alone may suffer, whereas in the syphilitic nearly always both are implicated. Both forms are often met with early in life, and hence it is by no means always easy to distinguish them from each other. Perhaps, the most important diagnostic characters are that, in syphilitic ulceration, there is, ordinarily, greater derangement of the general health, more extensive involvement of structure, and more abundant discharge, than in the strumous variety. Useful information may also, commonly, be derived from the history of the case and the temperament of the patient, though the latter is frequently of negative value, as scrofula and syphilis may coexist.

The discharge attendant on this disease is noted for the intensity of its fetor, whence the term *ozæna*, by which it is generally designated. It is commonly of a thin, sanious nature, irritating, and profuse, requiring the frequent use of the handkerchief, rendering the poor sufferer disagreeable both to himself and to his neighbors. During sleep it often descends into the fauces and the stomach, causing nausea and sometimes even vomiting. In the more aggravated forms of the affection large quantities of inspissated mucus pass off, or, collecting in the nasal cavities, form thick, brownish incrustations, which drop off every fourth, fifth, or sixth day, only to be succeeded by another crop. Portions of cartilage and bone, or even entire bones, often die, and slough away. In syphilitic ulceration, more frequently than in the strumous, the ravages of the disease often extend to the proper bones of the nose and palate, and occasionally even to those of the face, eventuating in horrible and irremediable deformity.

The *treatment* of ulceration and ozæna must be regulated by the nature of the exciting cause. This, therefore, should always, if possible, be determined as a preliminary step. It should not be forgotten that a bloody and fetid discharge may proceed from the nose in consequence merely of the presence of a foreign body, retained secretion, or disorder of the general health. Such cases are managed on general principles; they require no specific remedies. But it is otherwise when the disease is dependent upon a tainted state of the system. Here, a long course of treatment, involving the exercise of much patience on the part of the sufferer, and great skill on that of the surgeon, is usually necessary. When the strumous character of the malady is well settled, the different preparations of iodine, barium, and cod-liver oil are brought into requisition. If, on the contrary, there is reason to believe that the disease has been induced by syphilis, mercury and iodide of potassium should be employed, to an extent commensurate with the exigencies of the case. In general, there is no remedy which makes so rapid and decided an impression as local bleeding by means of a leech applied every fourth or fifth day directly to the inflamed surface. During the height of the morbid action, free purgation and the antimonial and saline mixture may be demanded. Ordinarily, however, stimulants, and not depletory measures, are necessary, as is evident from the pallor of the countenance, and the emaciated condition of the frame.

To allay fetor, and assist in establishing healthy action in the affected parts, various lotions are employed. The best are solutions of chlorinated soda, permanganate of potassa, chloride of zinc, nitric acid, nitrate of silver, and sulphate of copper. These fluids, properly tempered, are thrown twice a day into the nostril with a large syringe, the head being held forward over a basin, and thorough contact of the liquid with the inflamed surface being effected at each operation. The rule is not to permit the injection, in any case, to smart beyond a minute, and, as one article becomes inert, to substitute another. The black and yellow washes, as they are termed, and which are so useful in certain forms of syphilitic ulcers in other parts of the body, are objectionable in this, on account of their liability to descend into the stomach, and thus lead to ptyalism. For many years past I have been in the habit of employing, with signal benefit, in both varieties of the disease under consideration, a solution of sulphate of copper and tannin, in the proportion of one-fourth of a grain of the former and three grains of the latter to the ounce of water. When there is much fetor, a small quantity of chlorinated soda may advantageously be added to the other ingredients. In old, obstinate cases, a rapid cure may sometimes be effected by washing out the nostril freely, twice a day, with a solution of chloride of zinc, in the proportion of about one drachm to eight ounces of water. When the diseased spot can be reached, as it may be, when seated in the anterior and inferior part of the nose, the nitrate of silver and the sulphate of copper may be applied in substance, or the sore may be touched very lightly with the dilute acid nitrate of mercury. Some of the milder unguents, as the citrine and calamine, may prove serviceable by softening the scabs, and promoting healthy granulation. When there is swelling, with pain or tenderness in the nose, leeching will be serviceable.

3. *Hypertrophy.*—Hypertrophy of the mucous membrane of the nose is observed chiefly in children and young persons of a weakly, strumous constitution. Its most common site is the anterior extremity of the inferior turbinated bone; it consists of an enlarged and thickened state of the mucous tissues, dependent upon a process of hypernutrition, along with effusion of sero-plastic matter. The subjacent bone occasionally participates in the disease, becoming soft, porous, and expanded. Upon looking into the nostril with the aid of a strong light, the part presents the appearance of a small tumor, of a scarlet color, and of a spongy consistence, with numerous little vessels ramifying over its surface. It is generally of slow development, and the only inconvenience which it produces is its mechanical obstruction, which is sometimes so great as to lead to considerable embarrassment of breathing in the corresponding cavity. Both nostrils occasionally suffer, though seldom in an equal degree. The only affection with which it is liable to be confounded is polyp, but from this it is always easily distinguished by its site, scarlet color, and fixedness. The disease may continue, with perhaps little change, for years, and finally disappear spontaneously. The remedies best adapted to its cure are purgatives, and the different preparations of

iodine, especially the iodide of iron, with a leech occasionally to the part, and the semi-weekly application of the solid nitrate of silver. Punctures and astringent lotions are sometimes beneficial.

4. *Malformations.*—The most important malformation of the nose, surgically considered, relates to its septum. It consists of a kind of lateral curvature of the cartilaginous portion of the septum, with or without hypertrophy of its anterior extremity. In consequence of this deviation, the corresponding cavity is diminished in size, and the opposite one proportionately enlarged. Cases occur in which the obstruction, thus produced, amounts almost to complete occlusion, the patient being obliged to breathe nearly entirely through the unaffected nostril. The only remedy for this affection is excision of a portion of the offending septum, care being taken to avoid perforating it. The best instrument for performing the operation is a narrow, probe-pointed bistoury, with which the necessary slicing is safely and expeditiously executed. When the obstruction is seated at the very orifice of the nostril, a tolerably extensive dissection may be required in order to effect the desired object.

Congenital imperforation of the nostrils is uncommon; much more so than that of the ear, anus, urethra, or vagina. The occlusion may be caused simply by a continuation of the integuments, or by the presence both of skin and of fibrous tissue. In the former case, relief is sought by a cautious incision, and the subsequent use of the bougie; in the latter, by excision, provided the obstruction does not extend too far back, in which event it should be let alone.

5. *Calculi.*—Nasal calculi, technically termed rhinolites, are very infrequent; they are usually situated in the inferior meatus, are of an irregular shape, and vary from the volume of a pea to that of a pigeon's egg. Their surface is rough, and they are of a black, gray, or brown color, their centre often consisting of some foreign body, as the root of a tooth, a bead, or a cherry-stone. Their composition is phosphate and carbonate of lime, cemented by animal matter. These calculi are usually solitary, but sometimes they are multiple, or form in each nostril. Their presence is productive of the usual symptoms of obstruction of the nose, with more or less discharge of a sanious and fetid character. When of considerable bulk, they may cause a good deal of pain and inflammation in the neighboring structures. Simple inspection of the nostril generally suffices to detect them; when this fails, a probe is introduced, which, on coming in contact with the extraneous body, produces a characteristic click, not unlike what results from the contact of a sound with a vesical calculus. Extraction is accomplished with a hook, bent probe, or polyp-forceps; or, the attempt being unsuccessful, the concretion is pushed into the fauces, a finger being previously placed there to receive it. Sometimes expulsion is effected during a fit of sneezing.

6. *Foreign Bodies.*—Various substances may find their way into the nasal cavities of children, being generally placed there as a matter of amusement. The most common of these are grains of corn, peas, beans, beads, pellets of paper, buttons, fruit-stones, rags, and pieces of ribbon. If allowed to remain for any length of time, they always induce inflammation, and sometimes even ulceration of the lining membrane, with more or less pain, and a sanious, fetid discharge. In a case reported by Dr. Hays, the substance, a glass button, was retained upwards of twenty years, keeping up constant irritation. Their ordinary site is the anterior portion of the nostril, between the turbinated bone and the nasal septum, where they are often firmly impacted, and consequently difficult of spontaneous extrusion. Should the child, or an inexperienced person, attempt extraction, as too often happens in such cases, the foreign body will only be pushed farther in, and in this way it frequently passes entirely beyond the reach of the sight, being arrested, perhaps, pretty high up in the cavity, or forced against the floor of the inferior meatus.

Whatever the foreign body may be, it should always, for the reasons above mentioned, be extracted as speedily as possible. If the child is sufficiently old to co-operate with the surgeon, he is requested to take a pinch of snuff, and, during the effort of sneezing which is sure to follow, expulsion is often promptly effected, especially if care is taken at the same time to occlude the sound nostril by means of the finger. If the substance obstructs the passage completely, it may often be promptly dislodged by insufflation. For this purpose the unaffected nostril is closed by external pressure, when the surgeon blows forcibly with his own mouth into the mouth of the patient, the current of air thus established being sufficient to cause extrusion. In general, however, the removal of the foreign body is easily enough effected with a small, flexible, blunt, double hook, a probe bent at the end, or a piece of annealed wire, formed into a loop. The best instrument of all is the ear-pick, delineated at p. 305. The patient being in a strong light with the head inclined somewhat backwards, the instrument is carried obliquely upwards, on a line with the external nose, above and behind the foreign body, which is then extruded by a kind of jerking movement of the hand. The great fault usually committed by the surgeon, in his attempts at extraction, is that he inclines the instrument too horizontally, whereby he is sure to push the intruder only farther into the nostril.

In the American Journal of the Medical Sciences for April, 1860, Dr. W. S. King, of the Navy, gives an instance of the expulsion of a cherry-stone from the nose of a child during the action of an emetic, the mouth being tightly closed at the moment of emesis with a handkerchief.

When the extraneous substance is out of sight, it may be necessary to wash it away with a stream of water from a syringe, or to push it into the throat, and extract it through the mouth, as in a case communicated to me by Dr. William H. Pancoast. The patient, an Irish servant girl, in stooping over a pincushion, accidentally ran a hair-pin, two inches and a half in length, into the nose. When he reached her, she was bleeding profusely, and, on expanding the nostril, he could barely discern the point of the pin, which he immediately removed with a pair of forceps, aided by the index finger.

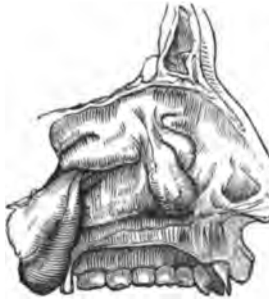
In a case mentioned to me by Dr. J. J. Moorman, of Virginia, the foreign body, a large bean, introduced a few days before and pushed far back into the nostril by the previous efforts at extraction, was propelled forward within reach of the forceps, by closing the mouth with the hand, so as to make the patient, a child two years old, breathe entirely through the nose.

Finally, it may be proper, in order to effect extraction, if the patient is very fractious and unruly, to administer chloroform; or, if this is objectionable, to secure his body with a stout apron, as in the operation for hare-lip.

7. *Polyps.*—The nose is a frequent seat of polyps, more so, in fact, than any other mucous cavity of the body. Numerous varieties of these morbid growths have been described by authors, but without any foundation in nature; for there are, in truth, only two, the gelatinoid and fibrous, which possess sufficiently distinctive characters to entitle them to separate consideration.

The *gelatinoid polyp*, fig. 237, resembles, as its name imports, a mass of jelly, or, more closely still, a common oyster. It is of a soft spongy consistence, of a white, greenish color, somewhat translucent, and invested by a prolongation of the mucous membrane. Its surface, which is generally smooth, or smooth at one point and rugose at another, nearly always presents a few small, straggling vessels, which serve to impart to it a peculiar striated appearance. In its shape the tumor is ordinarily somewhat pyriform, its attachment being by a narrow pedicle, while the broad, bulbous portion hangs downwards and forwards into the nostril. It almost constantly takes its rise from the superior turbinated bone; and sometimes exists in great numbers, though occasionally it is solitary. When carefully examined, it is observed to consist of a cellulo-fibrous substance, the cavities of which are occupied by a sero-albuminous fluid, much of which drains off on puncturing the investing membrane. Owing to this peculiarity of structure, the tumor is of hygrometric character, expanding in damp, foggy

Fig. 237.

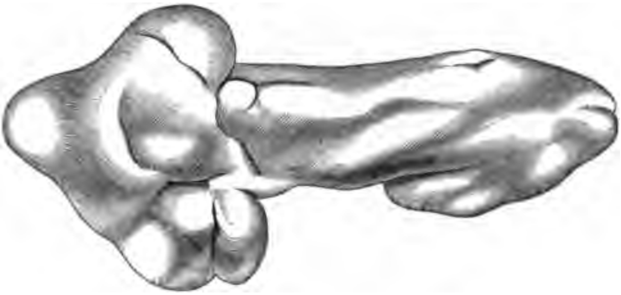


Gelatinoid polyp.

weather, and shrinking in dry. It is devoid of sensibility, breaks easily under pressure, is most common in persons after the age of forty, and frequently exists simultaneously in both nostrils. Its volume is usually diminutive. A polyp of this kind occasionally contains fibro-cartilaginous concretions, as in a specimen in my private collection, taken from an elderly gentleman.

The *fibrous polyp*, of which the annexed cut, fig. 238, from a specimen in my collection, exhibits a well-marked example, occurs at nearly every period of life; I have seen it in children under fourteen years of age, in adults, and in old people. More rare than the gelatinoid variety, it generally exists singly, is very prone to reappear after removal, and often displays a malignant tendency. It is ordinarily attached by a broad base to the superior turbinated bone, but occasionally it springs from the septum, floor, or wall of the nose. In the majority of the cases that have fallen under my notice, it was situated in the posterior part of the nostril, so as to be distinctly perceptible in the throat. Both sides may suffer simultaneously, but this is the exception, not the rule. The structure of the tumor is characteristic; it is composed of fibres, of a white, glistening color, exceedingly firm and tough, closely knit together, and most intricately arranged. Interspersed among these fibres are numerous vessels, both arterial and venous, the walls of which are very brittle, and, therefore, liable to give way under the most trifling accidents. Owing to this circumstance, this form of polyp is the seat of frequent, and, at times, profuse hemorrhages. For the same reason, it is always, in its recent state, of a dark red, purple, or modena color. Phosphatic deposits occasionally occur in its substance, and now and then the older portions undergo the cartilaginous, osseous, or earthy degeneration. When permitted to pursue its course, the tumor may acquire an enormous bulk, descending into the throat, protruding externally, and pressing against the walls of the nasal cavities in every direction. At this stage of the disease, the features are often frightfully disfigured, presenting that peculiar appearance, seen in fig. 239, denominated "frog-face."

Fig. 238.

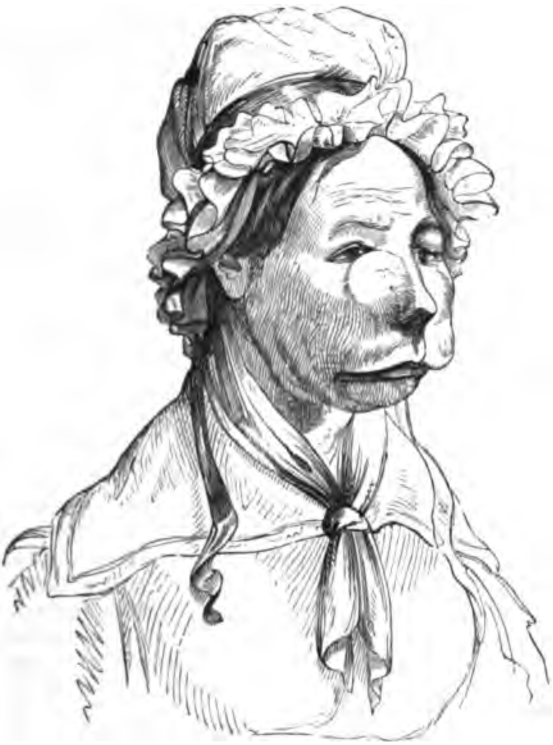


Fibrous polyp.

A fibrous polyp, the history of which has been admirably elucidated by Flaubert, Huguier, Nélaton, Robert, and other French surgeons, occasionally springs from the base of the skull, the petro-occipital suture, the inner surface of the great wing of the sphenoid bone, or even from the upper part of the spinal column, projecting, as it advances, into the nose and pharynx, and hence called the *naso-pharyngeal* polyp. It is of a very hard, dense texture, of a bluish or purplish color, and capable of acquiring a large bulk, its growth being rapid and uncontrollable by medicine. When extirpated it is apt to return, although now and then the operation is followed by permanent relief. A few instances are recorded of a spontaneous cure by sloughing. The tumor is usually attached by a broad base, closely identified with the periosteum of the part from which it springs. In its progress, it may extend down into the larynx, or, separating the muscles of the pharynx, pass into the zygomatic fossa and the face, although such an occurrence is extremely uncommon. No age is exempt from its attacks.

The *symptoms* of polyp are such as attend obstruction of the nose from any other cause. The first intimation which the patient ordinarily has of the disease

Fig. 239.



Frog-face; the polyps causing much deformity by expansion of the bones, and change of relative position in the soft parts.

is a sense of fulness and weight in one of the nostrils; he feels as if there were some fleshy substance in it, interfering with the transmission of air, and, as a necessary consequence, he makes frequent and abortive efforts to clear his nose, using his handkerchief, perhaps, every half hour. Gradually he observes some discharge, at first of a mucous, then of a purulent, and finally of a sanious character, fetid, and profuse. The voice seldom remains natural; generally it is nasal, indistinct, and even snuffling; the sleep is embarrassed, and attended with loud snoring, the head being thrown back as in enlargement of the tonsils; the nose is blown with difficulty, and, during every effort of the kind, most of the contents of the nostril are forcibly projected into the fauces; the sense of smell is materially impaired; and eventually, as the growth spreads, the affected cavity is completely deprived of its functions. At this advanced stage of the disease, the patient occasionally experiences lachrymation from the pressure of the tumor on the nasal duct; partial deafness, from pressure on the Eustachian tube; and slight dizziness, from pressure on the jugular vein.

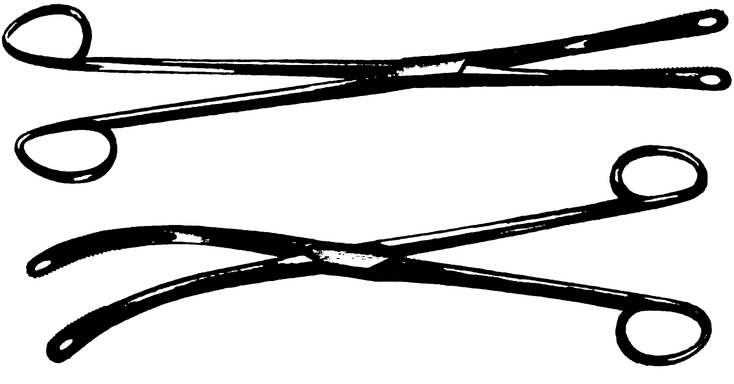
The symptoms above enumerated are, unfortunately, not characteristic; they may be, and often are, simulated by other affections. Thus, the person may labor under enlargement of one of the turbinated bones, hypertrophy of the mucous membrane, malposition of the nasal septum, or malignant disease, either of the nose itself, or of the maxillary sinus; or, finally, there may be a foreign body in the nose, causing serious obstruction, and profuse, sanious, and fetid discharge. To make sure of the diagnosis, the polyp must be seen or felt. Protrusion at either opening of the nose at once decides the matter; but, in the absence of this, a careful inspection is made with the speculum, in a strong light, with the head inclined backwards; a grooved director is used, if necessary, to move the tumor about, and determine its size, consistence, and point of attachment. If the tumor is covered with mucus, clearance is first effected by blowing the nose, or, this failing, by means of a pellet of cotton wrapped round the end of a probe. When the polyp lies far back it may project into the fauces, and thus satisfactorily reveal its character; should it not yet have descended, the index finger is introduced into the mouth, and carefully carried round the velum of the palate.

There are several circumstances which generally serve to distinguish a gelatinoid from a fibrous polyp. In the first place, they differ essentially in their complexion; the former being always white, like an oyster, a lump of mucus, or a mass of jelly, while the latter is of a deep red, purple, or modena color. Secondly, the gelatinoid polyp is generally smaller, and, consequently, its existence less marked in dry than in damp weather, which is not the case with the fibrous tumor, which is not affected by atmospheric vicissitudes of any kind. Thirdly, the discharge is always less profuse, less offensive, and less bloody in the gelatinoid than in the other form of the disease; and, finally, there is rarely any involvement of the general health in the former affection, while in the latter it seldom escapes, especially in the advanced stages. There is another circumstance which, perhaps, should not be omitted in this enumeration; it is, that the fibrous polyp usually grows much more rapidly than the other, and that it has a much greater tendency to encroach injuriously and disfiguringly upon the surrounding structures.

Of the *causes* of nasal polyps nothing is known. Although the disease has often been ascribed, among other circumstances, to the effects of external injury, the employment of snuff, the habit of picking the nose, and the irritation of decayed teeth, it is very questionable whether any of them are capable of exerting such an influence. However this may be, it is certain that most growths of this class are developed without any appreciable cause. Both sexes are liable to them, but males suffer much oftener than females. Polyps may attain a large size in a few months; or, after having made some progress, remain stationary for an indefinite period. I have seen the gelatinoid tumor attain, in less than a year, the volume of a hen's egg.

There is no doubt that a gelatinoid polyp of the nose is occasionally amenable to local remedies; but the cures thus effected are uncommon, and cannot serve as rules of practice even in ordinary cases. At one time a good deal of reliance was placed upon the use of finely pulverized bloodroot as a snuff, in the treatment of this affection; and in 1859 Dr. J. H. Reeder, of Illinois, published the particulars of two cases in which prompt cures were obtained by strong injections of the tincture of chloride of iron, aided by the application of a piece of sponge moistened with a solution of this article to the cavity of the nose. The

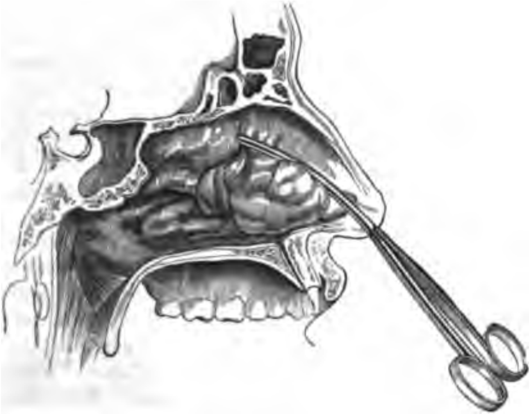
Fig. 240.



Polypus-forceps.

best plan, however, generally is not to waste any time in this way, but to proceed at once to the removal of the tumor. Fortunately, this is usually easily effected by torsion with the forceps. The instruments which I have long used for this purpose are represented in the adjoining sketches, fig. 240. They are very light and slender, being seven inches and a half in length, and provided with large rings. The blades, which are nearly three inches long, are fenestrated, and grooved internally, with well serrated margins. The great fault of the common polyp-forceps is that it is too short and clumsy. When the tumor is situated in the upper and back part of the nose, a curved instrument may sometimes be advantageously employed. The mode of applying the forceps is represented in fig. 241.

Fig. 241.

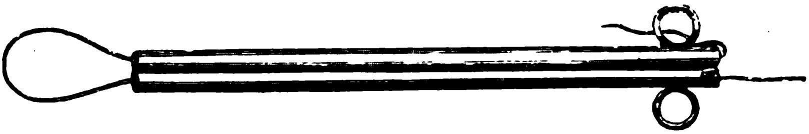


Mode of extracting a nasal polyp.

The patient being seated upon a chair, in a strong light, with the head supported upon the breast of an assistant, the operator introduces the forceps as high as the origin of the tumor, which he then seizes by expanding the blades over its pedicle. Assuring himself that the instrument embraces nothing that ought not strictly to be within its grasp, he turns it gently upon its axis, or round and round, until he succeeds in detaching the morbid growth. Were he to attempt to pull it off, he might tear away not only the tumor, but, perhaps, also a large portion of mucous membrane, if not, also, even a part of one of the turbinated bones. The whole procedure should, therefore, be conducted in the most careful and gentle manner. If the first attempt is unsuccessful, or if a part of the polyp is broken off, the instrument is reinserted, again and again, until the object is accomplished, not a particle of the growth being left behind. If more tumors than one exist, the others are dealt with in the same way, it being desirable, if possible, to effect complete clearance at one sitting. The blood which flows during the operation, and which has a tendency to conceal the polyp, is easily dislodged by blowing the nose, the sound nostril being compressed at the time to render the effort more effective. If riddance is impracticable in this wise, a stream of water, or of vinegar and water, is thrown up with a large syringe. It is rarely necessary to suspend the operation on account of hemorrhage; the bleeding is usually slight, and nearly always ceases spontaneously in a few minutes. When it threatens to be copious and persistent, plugging of the nose may be proper.

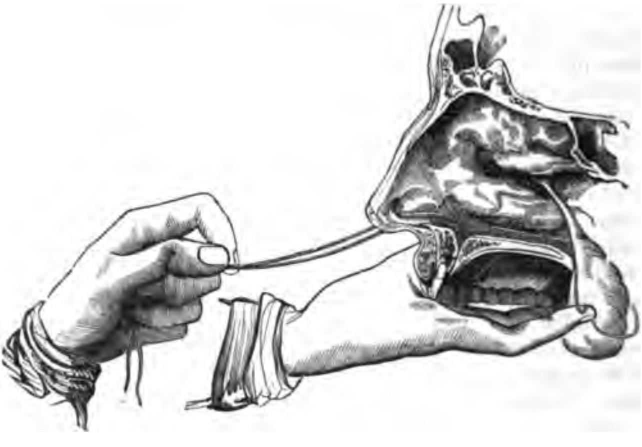
When the tumor is situated far back in the nose, or hangs down into the fauces, it may occasionally be broken off with the index-finger, introduced into the mouth, and carried round the palate. I promptly succeeded in removing, not long ago, in this way, a large gelatinoid polyp from a youth of seventeen; but I have no idea that the procedure would answer in the fibrous polyp, or even in a gelatinoid with a broad base. In the case adverted to, the tumor had a very narrow footstalk, attached to the posterior extremity of the inferior spongy bone, and was, therefore, easily torn asunder. Nothing can be accomplished here with the forceps, however ingeniously curved and dexterously used; there is no space for their application. When, therefore, the means just described are unavailing, removal must be effected with the double canula and a stout silver wire, represented in fig. 242. The instrument, which is four inches and a half in length, is conveyed along the floor of the nostril as far as the fauces, when the loop of the wire is properly expanded, and passed round the neck of the tumor, as near as possible to its origin. The ends of the wire are then firmly but cautiously pulled, and secured to the shoulders of the canula. The annexed cut, fig. 243, exhibits the mode of applying the instrument. The strangulation is seldom completed under three or four days, and, in the meantime, it is necessary that the wire should be frequently tightened. When the polyp is nearly ready to drop off, the finger is introduced into the fauces, and the canula is rotated on its axis, to promote the separation, lest, taking place during sleep, it should permit the tumor to pass into the windpipe or œsophagus. In the gelatinoid form of the disease, the safest and most expeditious plan is to twist off the polyp the moment it has been fairly embraced with the wire. I have occasionally succeeded in removing fibrous polyps, when situated far back on the floor of the nose, or at the posterior naris, with an instrument shaped like a common chisel, not more than two lines in width, and beveled on one side at the extremity, so as to afford a moderately sharp edge. The growth is easily scraped off from its connections, especially if counter-pressure is made upon it with the index-finger in the fauces. The operation, however, is generally attended with a good deal of bleeding, rendering it occasionally necessary to plug the nose.

Fig. 242.



Double canula.

Fig. 243.



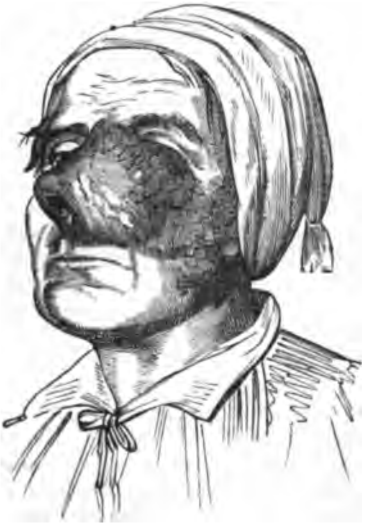
Mode of ligating a nasal polyp.

When the fibrous polyp is of extraordinary bulk, and quite inaccessible by the means now pointed out, its removal can be effected only by the knife, or the knife and saw. When the disease is malignant, no operation should be attempted, not even with a view to temporary alleviation; much blood will be likely to be lost, the manipulations will be tedious and painful, and the patient may die on the table. Under opposite circumstances, the operation is performed at all hazards, and with a prospect of a favorable issue. An incision, in the form of an inverted ⊥, is made along the junction of the nasal and maxillary bones, commencing just below the lachrymal sac, and terminating a little below the level of the nostril, the flaps being dissected up, and held asunder.

No particular treatment is required after the more common operations of this kind; there is usually very little inflammation or discharge, and in a few days the patient is able to go out about his business. To prevent relapse, it is customary to inject the nose once a day with some astringent wash, as a solution of nitrate of silver, zinc, copper, or alum. The practice may, however, in general, be advantageously dispensed with; it is only when there is evidence of persistent morbid action that it is likely to prove beneficial. In the gelatinoid variety of the affection, where the tendency to regeneration is sometimes most remarkable, and also in the gregarious form of this disease, I have occasionally broken off as much as one-half, and even two-thirds of the implicated spongy bone, believing that this procedure was greatly preferable to the frequent repetition of the ordinary operation.

For the removal of the *naso-pharyngeal* polyp two distinct operations have been proposed; one by Nélaton, consisting in the division of the soft and hard palate; the other by Flaubert, of Lyons, consisting in the excision of the upper jaw, first practised by him in 1840, and now recognized as a perfectly legitimate procedure in this formidable variety of morbid growth. The former method is more particularly applicable when the tumor is situated partly in the nose and partly in the pharynx, or when it springs from the middle of the base of the skull, the superior portion of the spine, or the internal surface of the pterygoid process, at the same time sending a prolongation into the pharynx. It is executed by dividing, first, the soft palate in its whole length, and then, by means of the saw and pliers, so much of the hard palate as may be necessary to afford complete access to the parts, the mucous membrane having previously been raised from the bone. Flaubert's operation is required when the polyp springs from the petrous portion of the temporal bone, the petro-occipital suture, or the margins of the foramina lacera. In some cases, as when the morbid growth is of extraordinary size, the entire bone is obliged to be sacrificed, whereas in others partial excision will suffice.

Fig. 244.



Encephaloid of the nose.

Whatever process be adopted, the surgeon cannot fail to perceive the necessity of thorough work. With this view, after the main tumor has been removed, its base should be completely scraped away, along, if possible, with the mucous membrane and periosteum to which it was attached. To do less, would only entail a speedy recurrence of the disease.

It is not surprising that operations so severe as these should occasionally be followed by fatal results, either primarily from shock and hemorrhage, or secondarily from pyemia, erysipelas, or inflammation of the brain and its envelops.

8. *Encephaloid.*—The nose is occasionally the seat of encephaloid; sometimes by extension from the maxillary sinus, but more generally by direct development; chiefly in children and young persons; marked by the usual local symptoms, and invariably tending to destruction. The tumor, which may spring from almost any part of the nasal cavity, is liable to be confounded with polyp; but from

this it may commonly be readily distinguished by the remarkable rapidity of its growth, by its disposition to encroach upon the surrounding structures, by the great abundance of the accompanying discharge, and by the early involvement of the constitution, as denoted by the cancerous cachexia. The tumor is very friable, and often bleeds profusely from the slightest injury. The horrible disfigurement produced by this disease is well represented in fig. 244.

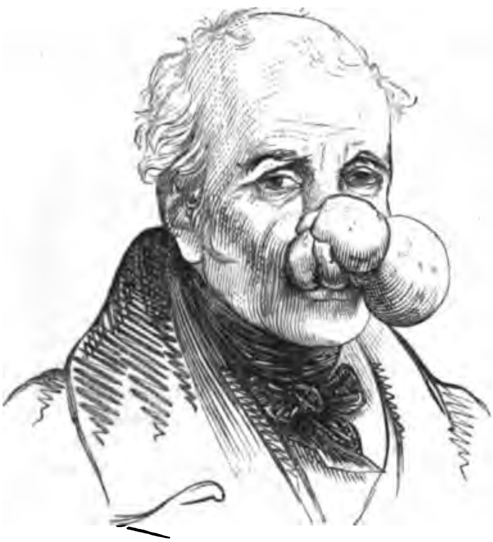
The treatment is purely palliative, operative interference being entirely out of the question. By attention to cleanliness, a nourishing diet, and the use of opiates, the patient is rendered comparatively comfortable, and enabled to eke out his miserable existence.

9. *Necrosis.*—Necrosis of the turbinated bones and also of the vomer is sufficiently common as an effect of tertiary syphilis. The disease may be limited, or it may involve the whole of one of these pieces. The symptoms are muco-purulent discharge, more or less abundant, excessive fetor, and a feeling of weight and soreness in the nostril. The treatment consists of deodorizing and slightly detergent injections, with removal of the dead bone as soon as it is found to be sufficiently detached. When the whole turbinated bone is necrosed, it may be necessary to break or divide it, in order to facilitate extraction.

10. *Wounds.*—Wounds of the nose, whether incised or lacerated, demand the nicest adaptation of their edges, and the most careful maintenance by wire sutures, introduced with a properly curved needle. Adhesive strips may be necessary to aid the approximation. Any tendency of the parts to fall in towards the nose should be counteracted by filling the nostril with a roll of lint; few cases, however, will require such interference.

11. *Lipoma of the Nose.*—There is a curious affection of the nose—so curious generally as to excite the risibility of the observer—to which the term lipoma is applied, from the fact that it essentially consists in an accumulation of the subcutaneous adipose substance, along with marked hypertrophy of the integument. The drawing, fig. 245, borrowed from Liston, exhibits the disease in an extraordinary degree of development. The tumor has a lobulated appearance, or, more correctly speaking, it is composed of several distinct masses, having, seemingly, one common origin. The growth, which is always chronic and painless, is almost exclusively confined to elderly male subjects with a ruddy complexion and an active capillary circulation, addicted to the pleasures of the table and to alcoholic potations. The chief inconvenience which it produces is of a mechanical character, obstructing vision, compressing the nostrils, and interfering with eating and drinking. Occasionally the surface becomes very red and inflamed, and may, in time, even ulcerate. The sebaceous glands are occasionally much involved in the morbid action, being enlarged, obstructed, and transformed into distinct cysts.

Fig. 245.



Lipoma of the nose.

The only remedy for this disease, when it has attained any considerable development, is excision; when small and of recent standing, removal may sometimes be effected by sorbefacient applications, especially the tincture of iodine, a change of the patient's habits, and the steady use of purgatives. When excision is determined upon, the surgeon may expect to encounter a good deal of hemorrhage, owing to the enlargement of the cutaneous and other vessels, but this may usually be effectually controlled by ligature and compression. Care should be taken not to inflict any injury upon the cartilages of the nose.

12. *Rhinoplasty.*—The nose, from accident or disease, may be so impaired in its form and size as to require reconstruction by the aid of plastic surgery. The operation which is performed for this purpose is, accordingly, denominated rhinoplasty. The lesion for which, in civilized countries, interference is usually demanded, is constitutional syphilis, or the joint action of syphilis and mercury, which often destroys nearly every portion of the nose, except, perhaps, a small vestige of the bridge, causing, thereby, the most hideous deformity. The horror and distress of the case are greatly increased when the ravages extend to the frontal sinuses, the lachrymal passages, the upper lip, the ethmoid and spongy bones, and the soft and hard palate; in the latter event, throwing the nose and mouth into one immense cavern, an occurrence which not only seriously affects the speech, but readily admits the passage of food and drink from the latter into the former.

The deformities of the nose requiring plastic interference may very properly be arranged under the following heads:—1. Loss of the entire organ, bones as well as soft parts. 2. Destruction of the whole or greater portion of the cartilages, the bridge remaining intact. 3. Mutilation of the tip, as when a small piece is cut or bitten off, including a part of both wings. 4. Loss of one wing, either alone or together with the nasal column. 5. Perforation of the nose, either on the top or at the side; in the latter case, with or without participation of the cheek. 6. Sinking of the organ from destruction of the cartilaginous septum of the nose, the soft structures being but little, if at all, affected. 7. Loss of the column. 8. Mutilation of the nose and upper lip, or of the nose, lip, and cheek.

For the repair of these various defects, some of the nicest processes of the art and science of surgery are required; but, even with the very best skill that can be employed in their application, success is by no means always to be looked for; on the contrary, the surgeon will too often have occasion to lament the occurrence of some unexpected or unavoidable event which frustrates his hopes, and disappoints the expectations of his patient. It is, therefore, of the greatest consequence, as stated in the general chapter on plastic surgery, that everything should be done beforehand calculated to insure a favorable result. If the operation is entered upon heedlessly, and without due preparation of the part and system, failure will almost be certain.

The integument required for closing the chasm in the nose may be borrowed from the immediate vicinity of the organ, or from some distant part. In the Indian method, as the former proceeding is usually called, the flap is obtained either from the forehead, the cheek, the upper lip, or the nose itself, according to the exigencies of each particular case. In the other procedure, which bears the name of Taliacotius, in commemoration of its inventor, or "the Italian method," from the country of his nativity, the operculum is taken from the arm. The operation, however, chiefly in consequence of the tedious and painful confinement of the head and limb, is now seldom employed, although instances occasionally arise in which it may be had recourse to with great advantage.

When an entire nose is to be reconstructed, the Indian method certainly deserves the preference, provided it is possible to obtain the requisite amount of substance from the forehead. Supposing that everything is favorable to the operation, the first step will be to measure off the shape and size of the flap. For this purpose, the defective part should be replaced with a wax-mould, a piece of gutta-percha, or a lump of dough, representing as accurately as possible the outline and dimensions of the original organ. A piece of soft leather is then stretched over the artificial nose, to the shape of which it is cut with great care, including the column, or central portion. Another piece of leather, one-third larger than the former, is then fashioned, this addition being necessary to provide against shrinkage, which, in time, generally reaches fully this extent, if it does not exceed it. As a general rule, it may be stated, that the flap should be from two inches and three-quarters to three inches in length, by two inches and a half in width at its widest part. In this length is included the column, which should be about one inch and a quarter in length, and from six to eight lines in width, according to the breadth of the nostrils. When the column is borrowed from the upper lip, the caudiform portion of the flap is of course omitted. The pedicle of the new nose must be from six to nine lines in width, and so long as not to displace the left eyebrow when it comes to be twisted upon itself, which, for the sake of convenience rather than anything else, is usually from left to right. The shape and size of the flap are to be carefully mapped off, just before the operation, with tincture of iodine, the preference being always given to the central portion of the forehead, unless there are contra-indications, in which event it should be taken from one side. The shape of the flap, and the manner of forming it, are shown at p. 347.

These preliminaries having been gone through, the patient, placed recumbent, with the head and shoulders gently elevated, is put under the influence of chloroform, it being desirable that he should be as passive as possible during the operation. A roll of lint being now inserted into each nostril, to prevent the ingress of blood, an incision is made with a very sharp, narrow scalpel, along the iodinized track. The cut on the right side is extended down, close along the brow, to the root of the nose, while on the left side it reaches hardly as low as the level of the brow, being prolonged afterwards, if it should be deemed advisable. In performing this part of the operation, it is of the utmost importance not to interfere with the angular artery, as the vascular supply of the new nose will mainly depend upon its integrity. The parts are divided, at the first stroke of the instrument, down to the periosteum, which is left intact. The gap in the forehead being now sponged, and the bleeding arrested by ligature, its edges are immediately brought together by several points of the interrupted suture and adhesive strips, as little being permitted to remain open as possible.

The next step of the operation consists in paring the edges of the mutilated organ, and removing such redundancies as may be in the way of the new material. The skin over the bridge of the nose should also be slightly revivified in order to facilitate adhesion between the contiguous surfaces.

In the third step of the operation the parts are stitched together by the common interrupted suture; or, what is preferable, by the tongue and groove suture of Professor Pancoast. In order, however, to do this properly, it is necessary that the edges of the flap should have been previously beveled off on the cuticular surface for about the eighth of an inch, as may readily be done in the act of forming it by running the knife along obliquely. The edges of the nose are beveled from without inwards, so as to form a groove for the reception of the tongue, an arrangement which thus brings together four raw surfaces. The connection is effected by passing a loop of thread with two needles, first through the inner lip of the groove, then through the base of the tongue, and lastly through the outer lip of the groove, all on the same level. The ends of the thread are then tied over a thin roll of adhesive plaster, thereby forcing the tongue deep into the groove. The number of sutures on each side must vary from three to five, according to the extent of the wound. The annexed cuts will serve to convey a better idea of making this ingenious suture than any description, however elaborate. Fig. 246 exhibits the mode of introducing the thread, and fig. 247 the manner in which the tongue is received into the groove.

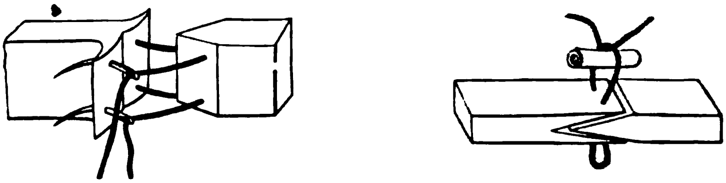


Fig. 246. Fig. 247.

Dr. Pancoast's tongue and groove suture.

All that now remains is to fix the caudal portion of the flap, intended for the column, in its proper position, a procedure requiring great care and attention in order to secure its adhesion. For this purpose a deep transverse opening is made in the upper lip, at its junction with the natural septum of the nose, from three to five lines in length, into which the extremity of the strip, previously divested of cuticle, is firmly implanted, a few points of suture being employed to keep it in place.

The lint inserted into each nostril, prior to the operation, is now replaced by a fresh tent of the same material, inclosing a small gutta-percha tube, to prevent the adhesion of the opposite surfaces, as well as to facilitate respiration. Narrow strips of isinglass plaster being stretched across the sides of the nose to effect more uniform approximation, the dressing is completed by applying a layer of charpie, wet with oil, along the line of suture, to prevent the edges from becoming dry and shrivelled. The greatest care is used that, while the contact is complete, there shall be no undue tension anywhere. The diet is light and cooling, the temperature of the room is regulated by the thermometer, and the head is well elevated by pillows. An anodyne is given immediately after the operation, and the dressing is not disturbed until the end of the third day. New tents are now introduced into the nose, and any sutures that are loose removed; otherwise they are not disturbed.

It occasionally happens that the pedicle of the flap is redundant, giving the upper part of the nose, especially on the left side, a full, unseemly appearance. When this is the case, the defect may be remedied by the removal of an elliptical portion of integument, care being taken not to perform the operation until the organ is perfectly capable of sustaining an independent existence.

The adjoining sketches afford a good idea of the success which often attends rhinoplasty, when properly executed. Fig. 248 exhibits the appearance of the parts prior to the operation, and fig. 249 nearly twelve months afterwards. The operation was performed at the College clinic, in 1856, with the aid of the tongue and groove suture, and the result was, in every respect, most gratifying, the organ remaining up to the present moment large and well shaped. It is proper to add that the flap was uncommonly large, as it always should be, and that it united throughout by the first intention.

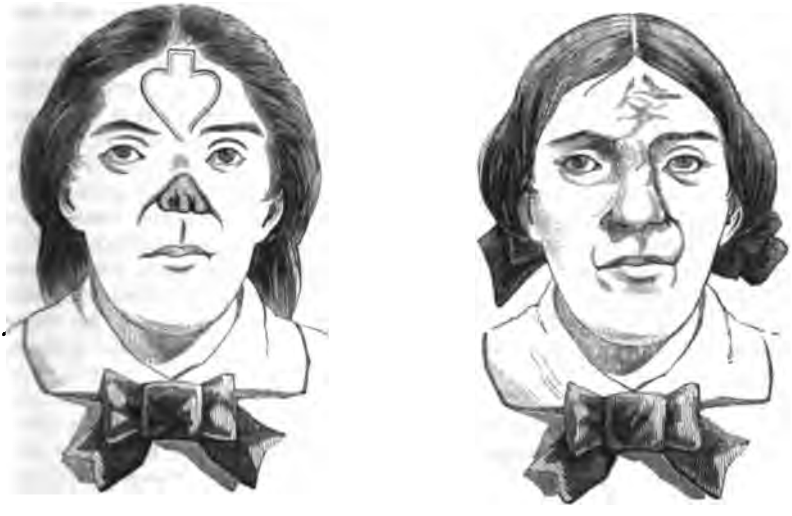
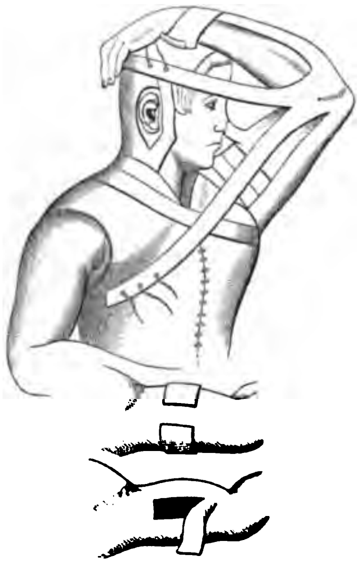


Fig. 248. Fig. 249.

Rhinoplasty and its effects.

The Italian operation has undergone several modifications. As originally executed by Taliacotius, and afterwards by his immediate disciples, it was a most tedious and trying procedure, well calculated to put severely to the test the patience both of the subject and the surgeon. The first step consisted in forming a suitable flap of integument at the inner and middle part of the left arm, over the flexor muscle, at least four inches in length by three and a half in width, its outline having previously been traced with ink. Two longitudinal incisions being made, the integument was carefully raised in its entire extent, or as far as the two transverse lines, and a piece of soft linen, well oiled, passed beneath it to prevent reunion. The wound, which, in the modern process, is closed by suture under the bridge, was left to suppurate, and, at the end of a fortnight, the flap, now thickened, hardened, and shrunk, by exposure, and covered with granulations on its posterior surface, was liberated at its superior extremity, which was then accurately stitched to the mutilated organ, the edges of which had been previously revivified for its reception. To prevent the sutures from giving way, the limb was brought up close to the head, and maintained in that position by an ingenious, but complex, apparatus, consisting of a cap and jacket, made of strong drilling; the arrangement and mode of application of which may be easily understood from the sketch, fig. 250, copied from the original treatise of Taliacotius.

Fig. 250.



Taliacotius's apparatus.

Another fortnight having been permitted to elapse, to afford the parts time for uniting, the flap was detached from its connection with the arm, and, after being properly fashioned, accurately fixed in the position which it was destined to occupy.

Taliacotius has left no statistics of his rhinoplastic operations, and we are, therefore, left in ignorance as it regards his success. From the great care, however, with which he has described his process, and from the fact that he attended numerous patients from abroad, it is reasonable to conclude that his success was highly flattering. He was evidently a most ingenious and skilful surgeon, far in advance of his age; and in the operation of reconstructing noses he dwells with great force and point upon the importance of having the adscititious parts of unusual dimensions, thus providing against the effects of shrinkage, one of the great obstacles to the formation of a good organ.

Professor Graefe, of Berlin, modified the operation of Taliacotius, by attaching the flap at once to the mutilated nose, thus limiting the period of the constrained position of the head and limb to five or six days, this being generally found sufficient to insure adhesion between the parts. The actual value of this process, now usually known as the German method, has not been fully tested, but my opinion is that, while it answers very well in some cases, it is, on the whole, inferior to the original plan, since it lessens the chances of reunion, and admits of greater shrinkage after the operation. In the Italian procedure, the new material, from its exposed situation, acquires a more vigorous circulation, as well as a greater degree of solidity and thickness, thereby fitting it the better for the maintenance of its new relations. Dr. J. Mason Warren, adopting the German modification of the Italian method, occasionally takes his flap from the anterior surface of the forearm, about two inches above the wrist, and generally succeeds in effecting an admirable cure, the transplanted skin being separated on the fifth day.

Small apertures, of an oval or circular form, the result of wounds, ulceration, or gangrene, are met with on various parts of the nose, and may generally be readily closed by the transplantation of a suitable flap from the cheek, the forehead, or even the nose itself, according to the circumstances of the case. A similar procedure will be required when there is partial destruction of the edge of the nose. When one of the wings is lost, it will generally be necessary to borrow the flap from the arm or forehead. When the nasal column is deficient, an admirable substitute may easily be obtained from the central portion of the upper lip, either by twisting the flap at its pedicle, or by everting the mucous membrane, the surface of which soon assumes the character of the cuticular tissue.

The nose is sometimes unseemly depressed, or caved in, in consequence of the destruction of its cartilaginous septum, without perhaps any injury of the skin, giving it more or less of an African expression. For such a defect, the only remedy is the construction of a new organ, all attempts to elevate the parts in a satisfactory manner proving useless for the want of proper support.

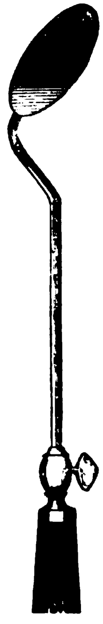
CHAPTER IX.

DISEASES AND INJURIES OF THE AIR-PASSAGES.

The principal surgical affections of the air-passages are, inflammation, œdema, croupous deposits, ulceration, polypous growths, warty excrescences, spasm, stricture, and foreign bodies. Before I proceed to describe these lesions, it will be necessary to offer some remarks upon the proper mode of inspecting the air-passages with a view to their more ready detection.

The investigation and treatment of the maladies of the larynx and trachea were, until recently, much embarrassed for the want of proper mechanical appliances by which the interior of these structures could be brought into view; but the difficulty has, in great measure, been overcome by the introduction of the laryngoscope by Dr. Czermak, of Pesth, who commenced his researches in 1857, and to whom is undoubtedly due the credit of being the first to employ such an instrument upon scientific principles, although a similar idea had previously occurred to Babington, Beaumès, Liston, Garcia, and others.

Fig. 251.



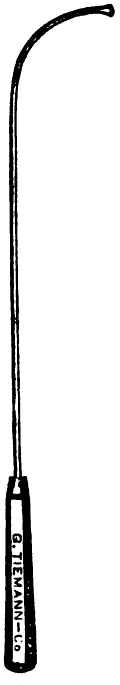
Laryngoscope.

The laryngoscope consists of a highly polished steel mirror, fig. 251, of a square, oval, or circular shape, mounted on a flexible but firm rod secured in a movable handle, and, on an average, about two-thirds of an inch in diameter by one line in thickness. Previously to its introduction it should be heated to as high a temperature as may be consistent with the comfort of the patient, either by holding it over the flame of a spirit lamp, or by plunging it into hot water, to prevent the respired air from becoming condensed upon its polished surface, and so rendering it unfit for use.

To light up the larynx and pharynx, a slightly concave glass mirror, fig. 252, resembling the ophthalmoscope, about three inches in diameter, with a small central perforation, is used. This is fitted in a light metallic frame, which is secured to a mouth-piece, by which the reflector may be held between the teeth; or, instead of this, it may be attached to a frontlet, or band encircling the head, the central aperture corresponding with the eye of the observer. The light of an argand lamp, concentrated upon the reflecting mirror, constitutes the best source of illumination, but, when available, the direct rays of the sun may be employed.

In conducting the examination, the lamp is placed on a table a little behind and to the right of the patient, so that the flame may be on a level with the roof of the mouth. The patient rests his hands upon his own knees, slightly advances his body, and throws the head a curved extremity being surmounted by a small round piece of sponge, of great softness and delicacy, and firmly attached by means of a strong thread, to guard against its coming off. The whole instrument is about ten inches in length. The sponge being slightly moistened with the caustic solution, the patient, seated upon a chair, is requested to open his mouth as widely as possible, and to take a full inspiration, followed by a gentle expiration, thus placing the parts in the best condition for the easy introduction of the instrument, and the prevention of spasmodic cough. While this is being done, the surgeon depresses the tongue, and carries the probang over the top of the epiglottis, and thence suddenly on, over the lower surface of that cover, downwards and forwards through the mouth of the larynx into the interior of that tube. A momentary contact is all that is necessary. The operation is generally followed by some cough, but this soon passes off, leaving the part and system comparatively comfortable. When the spasm is unusually violent, threatening suffocation, I have found the best remedy to be the inhalation of a little chloroform, which usually affords almost instantaneous relief. The operation in chronic disease should not be repeated oftener than every third or fourth day; in acute affections, on the contrary, it may be necessary to perform it every eight or twelve hours.

Fig. 255.

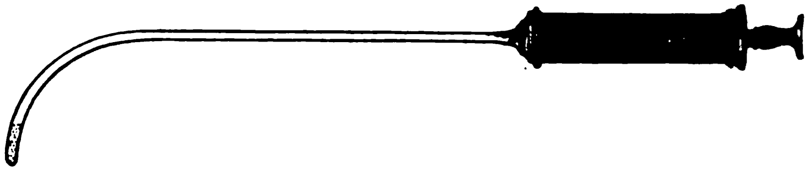


Lente's porte-caustique.

For applying solid nitrate of silver to the larynx and epiglottis, the most simple and efficient instrument that I know of is that sketched in fig. 255, devised by Dr. Lente. In the use of this substance great care must be exercised that it does not break off and fall into the windpipe.

Injections of nitrate of silver may be practised when the disease is situated in the trachea and bronchia beyond the reach of the probang. The parts having been thoroughly educated as in the previous case, the patient's head is retracted, and the tongue depressed, when a narrow gum-elastic catheter, about thirteen inches in length, is inserted into the mouth of the larynx, and thence passed rapidly on into the windpipe, leaving only about two inches and a half of the tube projecting beyond the front teeth. The nozzle of a small syringe is then introduced into the catheter, and the fluid thrown in as quickly as possible, lest the procedure should provoke violent coughing, and thus prove abortive. The strength of the solution should vary from ten to thirty grains of the salt to the ounce of water, to be gradually increased with the tolerance of the parts; and the quantity injected should not at any time exceed a drachm and a half, one third, or less, of this being quite sufficient at the beginning of the treatment. The operation, which is often followed by severe spasm, and which requires unusual dexterity for its successful execution, may be repeated every third, fourth, or fifth day, according to the exigencies of the case.

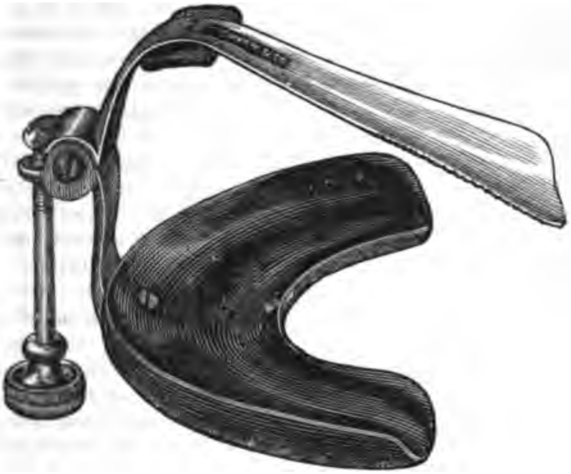
Fig. 256.



Laryngeal syringe.

When the object is merely to medicate the larynx, or the larynx and upper part of the trachea, the operation may be performed with the instrument delinebility, alleging that the instrument employed for the purpose, when it descends beyond a certain point, is always thrust into the œsophagus instead of being passed into the air-tubes. On the other hand, the treatment has received the approval of some of the highest authorities in the profession, and there is reason to believe that it has already rendered most important service in a class of diseases which, until its adoption, were generally found to be of a very hopeless character. The operation of mopping the windpipe is unquestionably not an easy one, but that it may be executed by any one of ordinary tact, and possessed of a correct knowledge of the anatomy of the parts, my observation abundantly attests. That the instrument is often passed down the œsophagus by awkward and ignorant practitioners is, I think, equally true. Experience is in this, as in every other operation requiring delicacy and skill, of vast benefit, and there is no doubt that he who enjoys it in the greatest degree is, all other things being equal, most likely to succeed in cauterizing the air-passages with facility and success.

Fig. 253.



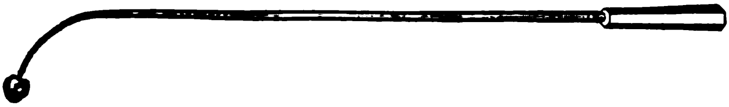
Dr. Church's laryngoscope and tongue depressor.

Cauterization of the larynx is particularly indicated in chronic affections of this tube, whether simple, syphilitic, or tubercular, or dependent upon the presence of warty excrescences. It is also very efficacious in acute inflammation, especially in that variety denominated membranous croup. Aphonia, caused by disease of the larynx, is likewise a suitable case for its employment.

The article with which the cauterization is effected is the crystallized nitrate of silver, in the form of solution, in the proportion of twenty to forty grains to the ounce of water. When ulceration is present, or when the medicine has ceased to produce the desired effect, the strength of the solution may be considerably increased; but for ordinary purposes this is unnecessary.

Ingenious instruments for mopping the air-passages have been devised by Semeleder, Elsberg, Gibb, and others. For ordinary purposes, a probang, like that sketched in fig. 254, answers sufficiently well. It consists of a thick whalebone rod furnished with a stout handle, and bent at an angle of nearly 45°, the

Fig. 254.



Sponge-probang for the larynx.

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COOPER MEDICAL

When tracheotomy is performed for either of these affections, a double canula must be worn until the urgent symptoms have passed off, when it may be removed, and the wound allowed to heal. The instrument should be frequently cleaned; and care taken that the air of the patient's apartment is kept moist and at a temperature of eighty-two to eighty-five degrees. Sometimes large masses of plastic matter are discharged through the wound or by the mouth. In the latter event, asphyxia may be caused by the lodgment of some of the substance in the glottis or by its imperfect expulsion from the larynx.

Syphilitic laryngitis generally belongs to the tertiary group of syphilitic phenomena; but as this form of the affection has been described in another part of the work, it is not necessary to reconsider it here. The proper treatment is by iodide of potassium in union with mercury, tonics and stimulants. When great respiratory difficulty supervenes, the only chance for the patient is tracheotomy.

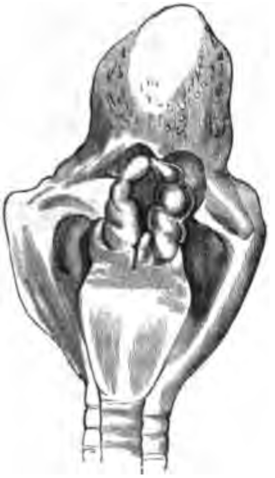
Laryngitis is also occasionally of a *tubercular* nature, and then nearly always passes into ulceration. Its coexistence with phthisis renders it nearly uniformly fatal.

Gangrene of the larynx is exceedingly uncommon, and must almost necessarily terminate fatally under any mode of treatment.

2. ŒDEMA.

The larynx is liable to œdema. The parts which are most commonly affected are the glottis, the lips of the organ, and the epiglottis, the edges and under surface of which are usually thickened and pulpy. The disease consists in an effusion of serum, or serum and lymph, in the submucous cellular tissue, leading to mechanical obstruction of the tube, and serious impediment in the respiratory functions. The swelling is devoid of vascularity, pits on pressure, and is generally most prominent round the margins of the larynx, which are often elevated into white, glossy, pendulous bags, not unlike those of the epidermis after the application of a blister. Small purulent deposits are sometimes seen in it, while its surface is occasionally incrusted with patches of lymph. The swelling is of a pale straw color, reddish, mottled, or greenish, and disappears almost completely when cut or punctured. The base of the tongue, pharynx, tonsils, uvula, and palate ordinarily participate in the morbid action, as is evinced by their inflamed condition. The mucous membrane of the larynx is heightened in color, and the lymphatic ganglions in the immediate vicinity of the tube are often enlarged, infiltrated, and softened. The adjoining cut, fig. 258, from a specimen in my collection, affords a good view of this disease.

Fig. 258.



Œdema of the larynx.

Œdema of the larynx is usually insidious in its origin, and rapid in its progress, often terminating fatally in a few days. It is more common in men than in women, and is rarely observed before the age of puberty. In children it is sometimes induced by the inhalation of steam, or by drinking hot water from the spout of a tea-kettle. It often comes on suddenly, during the progress of other complaints, as scarlatina, measles, smallpox, tonsillitis, erysipelas, and typhoid fever, and is evidently of an inflammatory character, though its exciting cause is then seldom obvious.

The disease is marked by embarrassment of breathing, fits of coughing, change of voice, and threatened suffocation. Most commonly, the first indication is soreness of the throat, with a sense of constriction in the upper part of the larynx, as if there were a foreign body impacted in it. The voice is hoarse, sharp, hissing, or croupish; the cough is dry, sonorous, and convulsive; deglutition is painful;

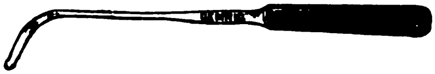
and the act of inspiration is performed with great difficulty and distress, while expiration is easy and unembarrassed. The obstruction to the breathing seems to depend, not so much upon the diminished capacity of the larynx, as upon the manner in which the tumid and infiltrated lips of the organ are drawn in by the air, as it rushes from the mouth into the lungs. The dyspnœa steadily increases; every respiratory muscle is called into play; the head is retroverted; the shoulders are elevated; the countenance is anxious and livid, from the imperfect aeration of the blood; and the poor patient, harassed with frequent paroxysms of suffocation, at length dies exhausted. High fever is always present in the latter stages of the malady.

The distinctive *signs* of œdema of the glottis are, the difficulty of drawing the air into the lungs; the almost total absence of pain in the larynx; a feeling of fulness in the upper part of the throat, conveying the idea of the existence of an extraneous substance; soreness in the throat, and impediment in deglutition, often so great as to render it almost impossible to swallow either fluids or solids. In many cases, especially in females, in whom the distance between the lips and the affected parts is, in general, considerably less than in men, the end of the index-finger may easily be brought in contact with the elevated epiglottis and the swollen lips of the larynx. In young, restive subjects it may be necessary, in conducting the exploration, to depress the tongue with a spoon, and to separate the jaws with a piece of wood.

Too much attention cannot be bestowed upon the diagnosis of this disease, which is, unfortunately, too often overlooked. There are few practitioners who cannot recall cases of this kind, and who have not had reason to regret their want of early discrimination, while life was still within the reach of remedies. An error of this description is the more to be lamented, because it is almost always fatal to the poor sufferer, who is sure to be suffocated by the mechanical obstruction which the swollen parts offer to the ingress of the air. The period at which death occurs from this cause varies from forty-eight hours to three, four, or five days.

The *treatment* of œdema of the larynx consists of purgatives and emetics, and of leeches to the throat, followed by fomentations, and by blisters to the nape of the neck. General bleeding can only be required when the patient is young and plethoric. When the symptoms are urgent, the affected parts must be freely scarified, to afford vent to the effused fluids, the cause of the whole respiratory difficulty. For this purpose the long probe-pointed bistoury of Dr. Buck, fig. 259, with a short double-edged blade, bent at an angle of 45°, is carried into the larynx, and moved about in such a manner as to divide the tumid and infiltrated structures at different points of their extent. The operation, which should be performed while the patient's head is thrown back, and firmly held by an assistant, the tongue being carefully depressed, and the jaws widely separated, is followed by hardly any bleeding, and is to be repeated at longer or shorter intervals, according to the amount of relief afforded.

Fig. 259.



Knife for œdema of the larynx.

The above treatment may often be advantageously aided by nitrate of silver, a solution of which, in the proportion of twenty grains to the ounce of water, should be applied freely, not only to the larynx, but also to the surrounding parts, which, as before stated, are generally seriously involved in the inflammation. If these means fail, and the obstruction to the respiration steadily advances, our only resource is tracheotomy, an operation which has often succeeded in such cases, under circumstances apparently the most desperate. In an instance under my care in 1855, although great relief followed the operation, the patient, a female, fifty years of age, died on the third day, from inflammation of the lungs. The ingress of air is promoted by the silver tube, or by means of hooks, as after tracheotomy for the removal of foreign bodies.

Of 168 cases of this disease analyzed by Sestier, 127 died. In 132 the ordi-

nary treatment was adopted, with a loss of 104. Of 36 cases subjec
chotomy, 13 recovered, and 23 perished. Scarification has afforded
most cures.

3. SCALDS.

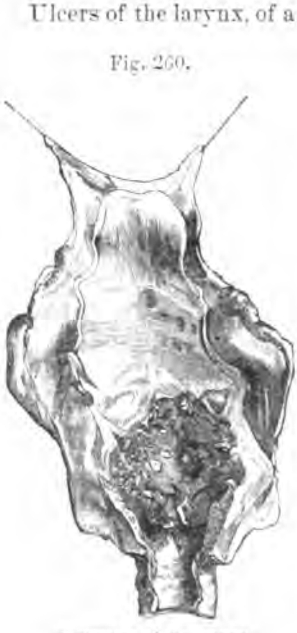
Scalds of the larynx may be caused by the inhalation of steam or
of hot fluids, the subjects of the accident being usually very you
Intense pain, restlessness, and difficulty of swallowing, followed
respiration dependent upon œdema of the glottis, and broncho-pul
gestion are the characteristic symptoms of the occurrence. The mo
and fauces are red, as well as here and there vesicated, and evidences
of the hot fluid also frequently exist upon the cheeks. The epiglo
round, and contracted, as if it had been scorched. In the worst
accident, the voice is croupy, sonorous râles are heard over the ches
tenance is of a purplish hue, the pulse is rapid and feeble, the surface
damp, the eyes are rolled up, the pupils are dilated, and the pati
comatose. If prompt relief is not obtained, death ensues from s
larynx, or from the joint influence of spasm and inflammation, the
extending to the bronchial tubes and to the substance of the lungs.

The kind of *treatment* must depend upon the violence and extent o
The milder cases will generally readily yield to ordinary antiphlogisti
as an active purgative, a mild emetic to expel the redundant muco
and leeches to the neck, or the upper part of the sternum. Whe
toms are urgent, tracheotomy is usually advised, but that it is r
permanent benefit is clearly proved by statistics, which show a sad d
of deaths to recoveries. The surgeon should, nevertheless, not hes
form it, as it is frequently the only chance of prolonging or saving li

Professor Bevan, of Dublin, recently communicated the particu
cases of scalds of the larynx all successfully treated by emetics, lee
upper part of the sternum, and calomel, in doses of one to two
half hour, until free bilious evacuations were produced.

4. ULCERATION.

Fig. 260.



Ulceration of the larynx.

Ulcers of the larynx, of a common, tubercular, syphilitic, or mercuri
not unfrequently met with. Commenc
in the muciparous follicles, or in litt
beneath the lining membrane, they are
circular in their shape, superficial, from
lines in diameter, and surrounded by t
edges. The mucous membrane in thei
vicinity is generally softened and abn
but now and then it appears to be ent
The ulcers, although they may occur i
tion, are most common in the vocal cords
the base of the arytenoid cartilages, t
of Morgagni, and the epiglottis, the lat
is particularly liable to suffer in terti
Ordinarily small and shallow, they so
cupy a large surface, or extend to a
exhibiting a frightful appearance, and
in their progress, muscles, ligaments,
and everything else that presents itself

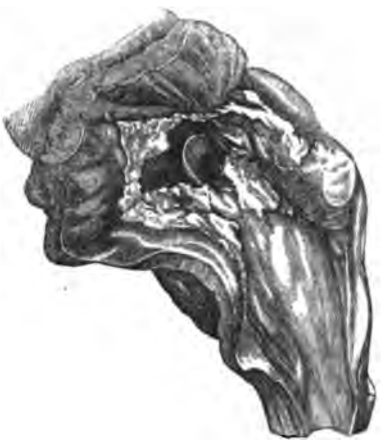
The *symptoms* of ulceration of the
according to the nature, seat, and e
lesion. The syphilitic form, fig. 260,
and Sieveking, is, in general, the most
the tubercular is also not unfrequent
with much pain and distress. Whe

cords, the ventricles, or arytenoid cartilages are involved, there will be a sense of heat and pricking in the larynx, hacking cough, a husky, wheezing, or whistling state of the voice, and difficulty of breathing, along with purulent and bloody expectoration. As the disease progresses the voice is reduced to a mere whisper, or becomes completely extinct, severe pain is experienced in the affected parts, hectic fever supervenes, and the patient finally dies from exhaustion of the vital powers, effusion upon the lungs, or constitutional irritation. The suffering is greatly aggravated when the epiglottis is seriously implicated; for there is then not only dyspnœa, with cough and change of voice, but every attempt at deglutition is attended with great distress, if not with a feeling of instant suffocation. In the more advanced stages of the malady, whatever may be its character or situation, the difficulty of swallowing is often so extreme that life is essentially abridged by starvation, the patient being sometimes unable for days together to take even liquids.

Ulceration of the larynx is always a dangerous disease. If the more common forms are occasionally recovered from, the more aggravated nearly always prove fatal. This is particularly true of the syphilitic and tubercular varieties, very few cases of which, especially in their more advanced stages, are ever cured under any treatment. The latter is, as a general rule, even more dangerous than the former. Serious involvement of the muscles, ligaments, and cartilages is always denotive of great danger, whatever may be the nature of the exciting cause of the lesion.

Ulceration of the epiglottis, usually the result of tertiary syphilis, may also be caused by the contact of irritating substances, as hot water, the alkalies, or corrosive sublimate, as in a case from which the annexed cut, fig. 261, was taken, and in which death followed in nine days from swallowing a large dose of this poison. The dissection revealed, besides ulceration of the epiglottis and surrounding parts, the existence of pneumonia, ulceration of the stomach, and inflammation of the entire intestinal track. The drawing is from Jones and Sieveking.

Fig. 261.

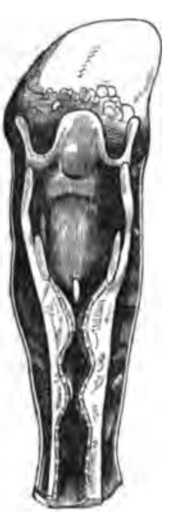


Ulceration of the epiglottis.

It must be obvious that the *treatment* of a disease, depending upon so many and such various causes, and the diagnosis of which is so obscure, cannot be conducted with much prospect of permanent relief. Indeed, experience has shown that temporary amelioration alone is usually to be looked for. When there is reason to believe that the lesion is owing to a syphilitic taint, mercury, iodide of potassium, nitro-muriatic acid, and kindred articles, must be employed. In ulceration, consequent upon tubercular deposits, little or nothing is to be expected from internal remedies, beyond the beneficial influence which they may exert upon the general health. In all cases, whatever may be the origin of the malady, permanent quietude of the affected organ is indispensable. Hence the patient must refrain from all conversation, and even, as far as practicable, from deglutition. When there is much pain, soreness, or tenderness in the parts, a few leeches may occasionally be applied to the front of the larynx, or the nape of the neck may be rendered raw with a blister. The best local remedy, however, is a solution of nitrate of silver, in the proportion of forty to fifty grains of the salt to the ounce of water, with which the ulcerated surface should be gently but efficiently touched, in the manner above indicated, every third, fourth, or fifth day, according to the tolerance of the parts. Should suffocation be threatened, laryngotomy may be performed, and a tube worn to facilitate respiration.

5. STRICTURE.

Fig. 262.



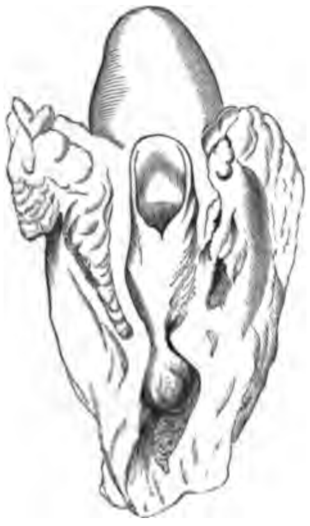
Double stricture of the windpipe.

Stricture of the windpipe, fig. 262, may be induced by a deposit of fibrin in the submucous cellular tissue, or, as is more frequently the case, by the contraction consequent upon a wound, the healing of a large ulcer, or the death and exfoliation of a portion of one of its cartilages. Great diminution of the tube is occasionally produced by the pressure of an enlarged thyroid gland. The symptoms are those of impeded respiration, gradually increasing, and surely tending to the destruction of the patient. The diagnosis is established by the history of the case, and by a careful exploration of the tube with the probang. Relief may be attempted, though with hardly any prospect of success, by dilatation with the bougie, passed from the mouth, or from below upwards, through an opening in the trachea. The treatment is conducted on the same principle as in stricture of the urethra, œsophagus, and other outlets. When the parts are very irritable, cauterization precedes the dilatation; and when the latter operation is impracticable, on account of the intractableness of the patient, control is effected by anæsthesia. In desperate cases the trachea is laid open, and a silver tube worn. By such a procedure, a patient may sometimes live in comparative comfort for many years.

6. POLYPS.

Polyps of the larynx are uncommon. They are of a globular, conical, or pyriform figure, and from the size of a small bean up to that of a pigeon's egg, a nutmeg, or even a large almond. Of a pale rose, red, or grayish color, they are of a fleshy consistence, more or less elastic, and invested by a prolongation of the mucous membrane. Microscopically examined, they are found to be composed of a fibro-celluar, fibrous, or fibro-plastic tissue, epithelial cells, and globules of fat. Their structure is, consequently, entirely benign. They are generally attached by a thin narrow pedicle to the ventricles of Morgagni, the vocal cords, the margins of the larynx, or the root of the epiglottis. Now and then an instance is met with in which they spring from a very broad base. They occur in both sexes, and have been most frequently noticed in phthisical subjects, after the fiftieth year. Their existence is indicated by a sense of constriction in the larynx, alteration and even entire extinction of the voice, croupy cough, occasional and gradually increasing dyspnœa, and violent attacks of suffocation, especially when the morbid growth changes its position. One of the most reliable signs is a valvular flapping sound, heard and felt as the tumor moves about during respiration. Occasionally, a portion of the tumor, or even the entire mass, is detached and ejected, thus, of course, dispelling all doubt respecting the nature of the disease. A careful exploration, both by sight and touch, will often be of essential service in determining the diagnosis.

Fig. 263.



Polyp of the larynx.

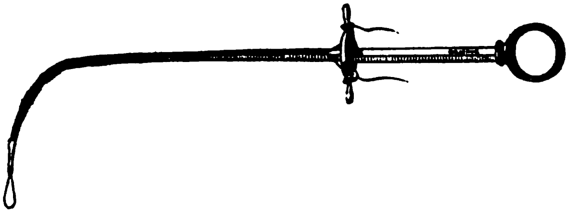
The annexed drawing, fig. 263, from a specimen in my collection, exhibits a well-marked growth of this kind developed in a man thirty-eight years of age, who finally died of tubercular ulceration of the larynx, in a state of profound marasmus. The tumor was about the size of a filbert, and of a fibro-cellular structure; it hung down by a rather narrow pedicle into the lower part of the tube. No suspicion of its presence had been entertained during life.

Great attention has lately been paid to the study of polyps of the windpipe, principally through the writings of Professor Ehrmann, of Strasbourg, who, in an able and beautiful monograph, published in 1850, collected all the facts then known upon the subject. In this country it has also been ably treated by Dr. Green, Dr. Buck, and Dr. Willard Parker. The paper of Dr. Buck, inserted in the sixth volume of the Transactions of the American Medical Association, comprises a tabular view of 42 cases of morbid growths within the larynx. Of 38 cases, in which the sex is stated, 27 were males and 11 were females. The ages ranged from 2 years to 65, nearly one-half occurring in young subjects. The disease, if left to itself, is almost necessarily fatal. Of the 42 cases, here referred to, only one was relieved by spontaneous expulsion. The majority perish from suffocation.

The principal remedy for these morbid growths was, until recently, excision. When the tumor projects above the larynx it may be seized with a pair of polyp-forceps, and snipped off with the scissors. If, on the contrary, it is imprisoned in the tube, it will be necessary to divide the crico-thyroid ligament, togther with one or both of the contiguous cartilages, so as to afford full and satisfactory access to the morbid growth. After removal, repullulation is prevented by the occasional application of nitrate of silver, or chromic acid.

Within the last few years small tumors of this kind have repeatedly been successfully removed by means of a wire noose, constructed upon the principle of a double silver canula. The most suitable contrivance for the purpose is that of Dr. Gibb, represented in fig. 264. It consists of a slender square bar, with a ring for the thumb at one end, and at the other a curved stem, grooved on its convex surface to within half an inch of the point, which is perforated by two small apertures. A cross-piece slides on the bar, and serves as a support for the fore and middle fingers. A fine steel wire is passed through the holes at the extremity of the instrument, and formed into a loop, with which the polyp is caught and detached, its situation having previously been determined with the laryngoscope.

Fig. 264.

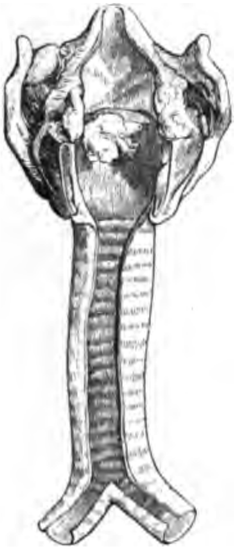


Gibb's laryngeal écraseur.

7. WARTY EXCRESCENCES.

Warty excrescences, fig. 265, similar to those of the vulva and penis, are sometimes found in the larynx. They are of a pale reddish or grayish color, of a soft, fleshy consistence, and of a rounded, ovoidal, or conical figure. Their surface is rough and fissured, like that of a cauliflower; their length varies from half a line to a quarter of an inch; and their attachment is either by a narrow pedicle or by a broad base, more generally the latter. These vegetations are usually associated with thickening of the lining membrane of the tube, and are nearly always dependent upon a syphilitic taint of the system. There are no distinctive signs of the disease. The history of the case, the altered state of the voice, and the feeling of uneasiness or of constriction at the top of the larynx, must serve to guide us in our diagnosis. In an old gentleman of sixty, who was under my care with this affection some years ago, the most prominent symptom was difficulty of swallowing fluids, owing to the indurated and contracted condition of the epiglottis, which felt as hard as a piece of wood. Antisyphilitic remedies, counter-irritation in front of the neck by blister, seton, or pustulated, and cauterization of the interior of the tube, constitute our chief resources in the treatment of the affection. They should be persevered in for a long time.

Fig. 265.



Warts in the larynx; growing in the situation of the vocal cords.

When the excrescences are large and numerous, the obstruction may be so great as to demand tracheotomy and the constant use of the silver canula. The best direct application, when the parts have been exposed by operation, is chromic acid. Sulphate of copper also exercises a repressing tendency.

8. CYSTIC TUMORS.

A cystic tumor, evidently the result of follicular obstruction, occasionally forms in the larynx or upon the epiglottis, causing dyspnœa, alteration of the voice, and difficulty of deglutition. In a remarkable case of this disease, in a boy eleven years old, observed by Mr. Durham, the tumor occupied the inferior surface of the epiglottis, and was so large as to occasion the most frightful embarrassment in the respiratory functions. It was of a rounded shape, very tense, and filled with thick glairy fluid, similar to that of a ranula. The mucous membrane immediately adjoining the tumor was swollen and œdematous. The diagnosis was readily established with the laryngoscope. Prompt and permanent relief was afforded by a free incision with a sharp-pointed bistoury. When such a tumor occupies the interior of the larynx, the only remedy would be excision through a suitable opening in the windpipe.

9. SPASM.

Spasm of the larynx, or of the larynx and trachea, may be produced by a great variety of causes, some of them directly connected with the air-passages and others indirectly, consisting, perhaps, in some disease of the brain or spinal cord, or some functional disorder of the œsophagus, stomach, bowels, or uterus. Violent dyspnœa occasionally results from an aneurism of the arch of the aorta or from a tumor in the upper part of the chest, compressing and interfering with the recurrent nerves.

Persons are sometimes instantly suffocated from the ingress of a foreign body into the windpipe, or from its lodgment upon the rima of the glottis. In such a case, the respiration may be permanently arrested in a moment, as effectually as from the administration of prussic acid, or a severe blow upon the head.

Inebriated persons occasionally die in the same manner during attempts at vomiting. In the exhausted condition of the system, consequent upon the inordinate use of ardent spirits, the contents of the stomach are lazily ejected, thus allowing some of the ingesta, as they proceed upwards, to lodge against the rima of the glottis, or even to descend into the windpipe.

Diseases of the epiglottis, disqualifying it for the due performance of its functions, remarkably predispose to this occurrence.

The effect of the passage of a drop of water into the larynx is familiar to every one. All fluids, however mild, are capable, when introduced into this tube, of exciting dyspnœa, and the most violent, spasmodic, and suffocative cough; but the impression is evanescent, for the reason that the accident does not produce mechanical obstruction to respiration. The moment the spasm subsides the breathing is re-established. All solid articles, on the contrary, whatever may be their character, will, by entering the windpipe, or resting against the mouth of the larynx, endanger life by suffocation.

A person laboring under delirium tremens, and confined so as to be unable to move, may, in an effort at vomiting, instantaneously perish from the introduction of food into the air-passages. Many such cases, it is to be feared, occur without the real cause of dissolution being known.

Suffocation is occasionally produced by the sudden ingress of blood into the windpipe. This sometimes happens during operations upon the mouth and throat, and even during the performance of tracheotomy itself.

Violent, and, indeed, fatal effects are occasionally produced by the impaction of foreign bodies in the pharynx and œsophagus. In most cases, the bad effects are caused by the spasm which the extraneous substance induces in the muscles of the larynx; but occasionally it proceeds from sheer mechanical obstruction.

In the *treatment* of spasmodic affections of the air-passages, careful inquiry should be made into the nature of the exciting cause, for it is only by doing this that the practitioner may hope to devise a rational plan of cure. The general health, if at fault, must be amended, the secretions corrected, and all sources of irritation, local and general, removed. As means of immediate or temporary relief, the most suitable remedies are antispasmodics, particularly chloroform, morphia, and valerian, with anodyne fomentations to the neck, or, what is generally more efficacious, cloths wrung out of iced water. If the case is urgent, threatening suffocation, the only resource is laryngotomy. No operation of this kind should, of course, be performed when the dyspnœa depends upon hysteria, dentition, or an aneurism of the arch of the aorta.

10. PARALYSIS.

Paralysis of the larynx and trachea may be caused by disease or accident; in the latter case usually by a blow or fall, eventuating in contusion of the muscular fibres of the tube, so as to disqualify it, in part, if not completely, for the exercise of its functions. The lesion is sometimes purely sympathetic, depending upon disorder of the brain, spinal cord, or digestive apparatus; and in this event, relief must obviously be sought in a correction of the antecedent evil. When caused by external violence, the symptoms may be of so urgent a character as to demand immediate recourse to bronchotomy.

11. FISTULE.

Fistule of the windpipe is occasionally congenital; most generally, however, it is caused by wounds refusing to heal in consequence of the overlapping of their edges, or the presence of some extraneous substance, as a piece of necrosed fibro-cartilage. Its size varies, of course, in different cases; usually it is very diminutive, perhaps hardly as large as an ordinary pin's head. Its edges have a red, raw appearance, and there is usually a small quantity of mucous discharge, at once indicative of the nature of the lesion.

When a fistule of the trachea has continued for a long time, the tube above the opening is very apt to become contracted, thus interfering materially with the cure of the case.

The *treatment* consists in paring the edges of the opening, both in the tube and in the integument, and in approximating them by several points of the interrupted suture. The milder cases occasionally yield to gentle cauterization with the solid nitrate of silver.

12. HERNIA OF THE TRACHEA.

The trachea is liable to protrusion of its lining membrane between two of its rings, constituting what has been, absurdly enough, called "bronchial hernia." It is usually caused by severe straining; either suddenly, as occasionally happens in violent labor from forcibly holding the breath, or gradually, in consequence of loud and habitual efforts with the voice. The tumor which is thus formed is remarkable for its softness, and varies from the size of a pea to that of a pigeon's egg, increasing during exertion and diminishing under pressure. It produces no particular inconvenience, except what results from the disfigurement which it occasions. The proper remedy is steady, systematic compression, which, if it does not produce a cure, will, at all events, have the effect of preventing farther increase of the affection.

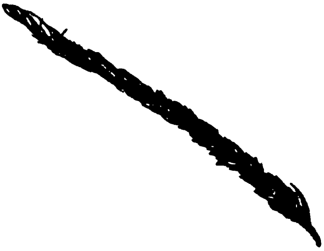
13. FOREIGN BODIES.

The air-passages are liable to the intrusion of a great variety of substances, referable to four distinct classes, the vegetable, animal, mineral, and mixed, the latter comprising such as are partly vegetable and partly animal, partly animal and partly mineral, or partly mineral and partly vegetable. Of these different substances, those which most commonly enter the air-passages, at least in this country, are grains of corn, beans, melon-seeds, pebbles, and cherry-stones. Bits of meat, bone, and gristle are also frequent intruders. Pieces of coin, pins, buttons, and similar articles are extremely liable to be entrapped in the windpipe, in consequence, apparently, of the foolish habit, so common everywhere, of holding such substances heedlessly in the mouth. I have been made acquainted with quite a number of cases, one of which fell under my own observation, in which the foreign body was a cockle-bur, represented in fig. 266. Substances of extraordinary size sometimes pass into the air-tubes. Thus, in the case of a child between three and four years of age, communicated to me by Dr. Foote, of Indiana, the foreign body, a brass pen-holder, was three inches and a half in length by three lines in diameter. It had descended into the left bronchial tube, where it was found after death, nine months after the accident, surrounded by thick matter. Several instances have been reported of the accidental inhalation of ears of rye, wheat, barley, and grass, as in fig. 267. Worms, especially the lumbricoid variety, have been known to creep into the windpipe; and at least one man has lost his life from the introduction of a leech into the sinus of the larynx. Gautier has reported a case of death from the inhalation of a small fish.

Fig. 266.

Cockle-bur.

Fig. 267.



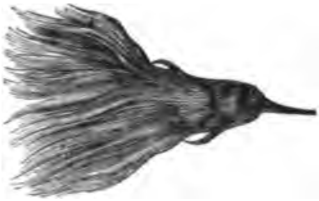
Ear of grass.

In my Treatise on Foreign Bodies in the Air-Passages, a number of cases are mentioned in which teeth, both natural and artificial, were inhaled. In several of the cases, the artificial teeth were connected together by metal, as in fig. 268. In this instance, the substance was retained for thirteen years, and was found, on dissection, in the right thoracic cavity, into which it had passed by ulceration. Mr. Nunn attended a man who drew a puff dart, represented in fig. 269, into his windpipe. Occasionally, the entrapped substance has been a bullet, as in two instances, reported to me, respectively, by Dr. Maxwell, of Indiana, and by Dr. Stitt, of Kentucky.

Fig. 268.

Artificial teeth.

Fig. 269.



Puff dart.

Two, three, and even four foreign substances sometimes enter the air-tubes, either simultaneously or successively. Dr. Sipe, of Missouri, has communicated to me the particulars of the case of a child, who, when the larynx was opened, ejected not less than a dozen fragments of parched corn. Dr. Mount, of Cincinnati, met with an instance, in an infant five weeks old, who, after the operation of laryngo-tracheotomy, expelled four pieces of unburnt coffee, three immediately, and the other and largest one the next day. Sometimes the substances are of a dissimilar character. Thus, in a case observed by Professor Van Buren, the child, upon the windpipe being opened, coughed up a water-melon seed and the shank of a plum.

Situation.—The foreign body may be arrested in different portions of the windpipe, or it may remain loose, and move up and down the canal during the expulsion and introduction of the air. Occasionally, it is stopped at the very entrance of the larynx; but more frequently, by far, it passes into the interior of the tube, and lodges in one of its ventricles. It is not often arrested in the trachea, or, if arrested, it does not long remain there. Instead of this, after having passed the larynx, it generally, either at once or at a very early period, descends into one of the bronchial tubes, from which, however, during a violent expiratory effort, it may again be impelled upwards, not only into the trachea, but even into the larynx. A needle, pin, bit of bone, or, in short, any sharp and slender body, might be permanently retained in the trachea, in consequence of its extremities becoming implanted in its walls; so also might a cockle-bur, a piece of meat, a lump of cheese, or a piece of sponge. A solid or heavy body, as a bullet, pebble, shot, or grain of corn, will, on the contrary, be almost certain to pass at once into the bronchial tubes, in obedience simply to the laws of gravity.

When a foreign body passes into the bronchial tubes, its tendency is to lodge in the right; a circumstance which has long been known, and variously explained. Thus, it has been supposed to be owing to the differences in the capacity and direction of the two tubes, the right being larger than the left and placed more horizontally. The real cause, however, would seem to be the ridge, or spur, in the lower part of the trachea, the position of which, towards the left of the mesial plane, has the effect of throwing the foreign body, as it descends, over towards the right side, an effect still further favored by the greater diameter of the passage. Sometimes, each bronchial tube contains a foreign body; and occasionally, again, although rarely, the substance is forced on beyond the primitive division into a secondary one.

The glottis, although by far the most common, is not the only, avenue by which foreign bodies may reach the windpipe; occasionally they enter the tube from without, either by penetrating the skin and muscles of the neck, as in the remarkable instance observed by De La Martinière, in which a little boy, in cracking a whip, forced a brass pin into the windpipe; or they may be pushed into the passage from the œsophagus, in consequence of the attempts made to extract them from this canal, as in a case which occurred to Dr. Eve. Again, foreign bodies may enter the lungs through the walls of the chest, instead of passing into them by the more natural and common route of the glottis. Finally, a case has been recorded by Mr. Edwards, of England, in which a bronchial lymphatic ganglion, an inch in length, passed through an ulcer in one of the bronchial tubes, and suffocated the patient, a boy eight years of age, by becoming impacted in the rima of the glottis.

Expansion.—When the foreign body is of a vegetable or animal nature, it is liable to imbibe some of the moisture of the surface with which it lies in contact, and thus increase in volume. The heat of the part no doubt also contributes to this result. The degree of expansion, which may be produced under the joint influence of these causes, varies too much to admit of precise statement. Beans, peas, and grains of corn, seem to be particularly prone to increase in bulk; sometimes a great deal even in a very short time. Occasionally the substance exhibits signs of germination. On the other hand, there are certain bodies which are incapable of thus expanding, as melon, orange, pear, and similar seeds, beef, cartilage, tendon, apple, cabbage, turnip, and other vegetable matter.

It is probable that the particular situation of the foreign body has some influence upon the change of bulk and consistence wrought upon it during its sojourn in the windpipe. A substance impacted in one of the bronchial tubes would, I think, be likely to experience this change in a greater degree, as well as more rapidly, than one lodged in the trachea, or larynx. The extent of contact should also be taken into account; and, finally, the character and quantity of the secretion excited by the presence of the extraneous body.

When a foreign body is long retained, especially in one of the bronchial tubes, it not unfrequently becomes incrusted with various kinds of matter, as inspissated mucus, mucus and lymph, lymph alone, or carbonate and phosphate of lime.

Pathological Effects.—The foreign substance may produce various changes in the structures with which it lies in contact, as well as in those in its neighborhood. Occasionally, though rarely, remote parts, as the lungs, trachea, and larynx, become affected, either primarily or secondarily, in consequence of the irritation thus induced.

One of the most common of these effects is inflammation of the mucous membrane, generally, however, of limited extent. When the foreign body is bulky, and creates great inconvenience, or is retained for a long time, the morbid action becomes diffused, often spreading a considerable distance beyond the part originally affected, and leading to deposits of lymph, if not also to softening. In chronic cases, the mucous membrane is liable to become thickened, indurated, and deeply congested. Ulceration is uncommon. Sometimes, though rarely, the foreign substance is partially surrounded by lymph, which thus serves to fix it in its situation.

When the extraneous substance is retained in the bronchial tubes, serious disease is liable to occur in the lungs, especially inflammation, which sometimes involves an entire lobe, if not the whole of the corresponding organ; now and then, indeed, the mischief extends even to the other lung, or both viscera may suffer simultaneously. Occasionally abscesses form, and continue to discharge for an indefinite period; they generally occur at the seat of the obstruction, or in its immediate vicinity, but sometimes at remote points. Their contents are of an unhealthy character, being more or less fetid, tinged with blood, and intermixed with mucus. The pulmonary tissues around them are usually densely hepatized, and deeply discolored.

A remarkable instance in which a foreign body—the hull of a bean—excited gangrene of the lung, fell under my observation in 1844, in a lad ten years of age, a patient of Dr. Bryan and Dr. Rodman. The disease came on about two months and a half after the accident, and was followed by the discharge of a large quantity of thick, blackish pus, of the most fetid character. Hectic fever, with rigors and night sweats, was present, and the body was reduced to a mere skeleton. After progressing in this manner for a number of weeks, the substance was finally ejected in a violent paroxysm of coughing, ultimately succeeded by complete recovery. Fetid matter continued to be expectorated for a long time after, and the chest, over the left lung, became permanently contracted.

Sometimes, again, the foreign substance, especially if retained for any length of time, induces a deposit of tubercular matter in the tissues immediately adjoining it. Pulmonary emphysema is another effect, but also a very rare one; and the same remark is true of œdema of the larynx.

The bronchial lymphatic ganglions are also liable to suffer. The most common alterations are enlargement, preternatural vascularity, and softening of their substance. Suppuration is infrequent. The morbid action sometimes extends to the pleura, leading to effusion of serum and lymph, extensive adhesions, and also, occasionally, to the formation of pus.

It is a singular fact that all these pathological changes may occur, to a greater or less extent, in cases where the obstruction is exclusively seated in the larynx or in the upper portion of the trachea.

In a few instances the heart and pericardium have been found inflamed, but whether from an extension of the morbid action from the respiratory organs, or from embarrassment in the pulmonary and cardiac circulation has not been determined.

When abscesses form after this accident, whether as a consequence of simple pneumonia or of the softening of tubercular deposits, the matter generally passes into the bronchial tubes, whence it is afterwards discharged by coughing or expectoration. Occasionally it points externally at one of the intercostal spaces, where it sometimes forms an opening through which the foreign body ultimately escapes. Dr. John L. Atlee has communicated to me the particulars of a case in which he ruptured a large abscess in the lung in an attempt at extracting the foreign body. When the substance is long retained, it may excite ulceration of the bronchial tube, and finally drop into the pleural cavity, causing destructive inflammation.

Finally, a foreign body may provoke fatal hemorrhage, as in a case related by Rokitansky, in which a small dart had been sucked into the trachea, and was forced into the innominate artery during a paroxysm of coughing. Dr. A. R. Terry, of Detroit, has communicated to me an instance in which frequent attacks of copious hemorrhage were excited by a percussion cap, which was spontaneously expelled at the end of three years.

Symptoms.—The symptoms which follow and accompany this accident may be divided into primary and secondary, or into those which take place at the moment of the introduction of the foreign body, and those which arise as a consequence of its sojourn in the air-passages.

The moment a foreign substance, however small, touches the windpipe, it excites severe distress and coughing, on account of the spasmodic action which it induces in the muscles of the larynx. A familiar illustration of this occurrence is afforded in the suffering which takes place when a drop of water, a crum of bread, or a particle of salt accidentally slips into the glottis. Instantly the most violent distress is excited, which generally continues until the intruder is dislodged. These symptoms, however, are commonly slight and transient compared with those that attend the intromission of a foreign body, properly so called. In the latter case, the patient is usually in imminent danger of suffocation, and, consequently, very fortunate if he escapes with his life. In the great majority of instances, he is seized with a feeling of annihilation; he gasps for breath, looks wildly around, coughs violently, and perhaps loses his consciousness. His countenance is livid, the eyes protrude from their sockets, the heart beats tumultuously, the body is contorted in every possible manner, and froth, or froth and blood, issue from the mouth and nose. Now and then he grasps his throat, utters the most distressing cries, or falls down in a state of insensibility. Sometimes he vomits, especially if the accident occurs after a full meal; and the relief occasionally experienced from this source is very great. In some instances, again, there is an involuntary discharge of feces and even of urine. A considerable quantity of pure blood is occasionally thrown up during the violent coughing, immediately consequent upon the accident.

ant, seeing that there is apparently nothing the matter, allows his mind to be lulled into a state of security, frequently not less injurious to himself than destructive to his patient. It is different with adults, who are usually conscious of the time and manner of such accidents, and who, therefore, rarely fail to give a correct account of them.

If the patient, supposing him to be a child, has been playing with a grain of corn, bean, pebble, or similar body, and has been suddenly seized with symptoms of suffocation, violent spasmodic cough, lividity of the face, pain in the upper part of the windpipe, and partial insensibility, the presumption will be strong that the substance, whatever it may have been, has slipped into the air-passages, and is the immediate and only cause of the suffering. The presumption will be converted almost into positive certainty if the child was just previously in the enjoyment of good health; if he was romping, jumping, or laughing at the moment of the accident, with the substance, perhaps, in his mouth, or while attempting to throw it into that cavity; and especially, if the symptoms, after having been interrupted for a few minutes, continue to recur, with their former, or even with increased, intensity, at longer or shorter intervals. The symptoms here enumerated, however, are sometimes most painfully simulated by the cough and embarrassment of breathing occasioned by cold and other affections. The difficulty in arriving at a correct diagnosis is still further augmented, in some of these cases, by the coincidence of the respiratory trouble and the fact of the child, at the moment of the seizure, having been engaged in playing with a substance such as that above mentioned.

Important information may frequently be obtained, in these accidents, by a careful exploration of the chest by means of auscultation and percussion. This is particularly the case when the foreign body is situated in the lower extremity of the trachea, or in one of the bronchial tubes, where, especially if it is bulky, or pretty firmly impacted, it must necessarily affect, more or less seriously, the respiratory functions, and thus manifest itself by the alterations which it induces in the sounds of the lungs and chest. These alterations are always less distinct, and, indeed, not unfrequently entirely absent, when the extraneous substance occupies the larynx, or the upper portion of the trachea.

A stethoscopic examination, however, although generally useful, and, therefore, never to be omitted, does not always afford satisfactory evidence of the nature of the case. Of the truth of this fact my observation has furnished me with several instances, in none of which, notwithstanding the most careful and repeated exploration, could the situation of the intruder be determined.

Two circumstances may be mentioned as likely to occasion such a result. In the first place the auscultatory signs may be masked by previous disease, or by disease awakened soon after the occurrence of the accident, as inflammation of the windpipe, lungs, or pleura; and, in the second place, the patient, especially if a child, may offer such resistance, either by his movements or cries, as absolutely to prevent the possibility of a thorough exploration. In the latter case, the obstacle may always be promptly and effectually surmounted by the use of chloroform.

Some inference, too, of a diagnostic character, may generally be drawn from the nature of the foreign substance. Ponderous bodies, such as bullets, shot, metallic buttons, pebbles, and pieces of coin, generally at once descend into the bronchial tubes, from which they will afterwards be unable to rise in the act of coughing, sneezing, or any other violent expiratory effort, as bodies are liable to do when they are of an opposite description.

If the foreign body is large, and at the same time very rough, angular, or spiculated, it will probably be arrested in the larynx or the trachea. The same circumstance will be likely to occur if it be long and narrow, as in the case of a needle, pin, nail, or fish-bone, unless it should happen to enter the glottis vertically, when it may at once fall into one of the bronchial tubes.

In some instances, as stated elsewhere, the foreign substance is capable of producing a peculiar noise, occasionally detectable even at a distance from the patient's body.

No definite information can be derived from the state of the *voice* when the foreign body lies in the trachea or in one of the bronchial tubes. Under such circumstances, it may be more or less changed, or, in rare cases, perhaps, even entirely absent; but as the alterations are not peculiar, but altogether similar to those produced in ordinary affections of the air-passages, it is evident that they are of no diagnostic value. The reverse, however, is the case when the foreign substance is retained within the larynx; for then the changes in the vocal functions, if not actually characteristic, may, in conjunction with other symptoms, afford most important, if not conclusive, information.

The *pain* accompanying this accident cannot be regarded as diagnostic, inasmuch as it may be produced by other causes, as inflammation, neuralgia, or spasm of the air-passages.

The symptoms of extraneous bodies in the respiratory organs may be imitated by different diseases, either directly affecting these organs or acting upon them sympathetically. Of these diseases the most important are croup, hooping-cough, ulceration of the larynx and trachea, aneurism of the aorta, and worms in the intestines.

It is generally easy to distinguish between the symptoms of a foreign body and those of spasmodic *croup*, by observing that, in the latter affection, the chief difficulty of breathing exists during inspiration, while in the former it exists during expiration. Important information may also be derived from the state of the voice, which is usually characteristic in croup, and from the state of the pulse and skin, which are rarely excited until after the extraneous substance has had time to cause inflammation and sympathetic irritation, whereas they are usually more or less seriously disturbed at an early stage in laryngeal disease. Besides, in the latter affection, the symptoms are continued, whereas in the case of a foreign body in the air-passages, there are frequent intermissions, followed by sudden aggravations of suffering. Professor J. B. S. Jackson has communicated to me the particulars of two cases, in which the symptoms produced by foreign bodies in the air-passages were mistaken for those of membranous croup.

Alarming symptoms, simulating those of a foreign body in the air-passages may arise during an attack of *hooping-cough.* Here mistake may be prevented, first, by a careful consideration of the history of the case; secondly, by the existence of the peculiar hoop, which is always wanting in the former affection; and lastly, by the fact that the embarrassment of breathing occurs in this disease, as in croup, not during expiration, but during inspiration.

Spasm of the glottis, by producing suffocation, may give rise to symptoms simulating those of a foreign body in the windpipe. A common cause of this is ulceration of the larynx. Should such an occurrence take place while the patient is eating, it would be very natural to ascribe it to the presence of a foreign body in the air-passages, although these passages might be entirely free from mechanical obstruction. The diagnosis, in such an event, would, of course, be extremely difficult, if not impossible. The history of the case might furnish some clue, though hardly any of a satisfactory character. Upon whatever cause the symptoms depend, tracheotomy alone would be likely to save the patient, and it should, therefore, be performed without delay.

Similar embarrassment may arise from an *aneurism* of the thoracic aorta. The pressure of such a tumor may produce great narrowing both of the trachea and of the bronchial tubes, particularly the latter, thereby seriously impeding the passage of the air to the lungs. The diagnostic signs, in cases of doubt, are the gradual approach and persistent character of the symptoms in aneurism, and their sudden, violent, and intermittent character when occasioned by the presence of an extraneous substance. Moreover, it is worthy of note that such accidents are most frequent in children, while aneurism of the thoracic aorta is almost exclusively confined to elderly subjects.

The sympathetic irritation induced by *worms* in the alimentary canal, may closely simulate the phenomena produced by the presence of a foreign substance in the windpipe. The most certain diagnostics, in circumstances of doubt, are the history of the case, and the prompt relief which usually follows the exhibition of anthelmintic remedies, when the affection is of a verminous character; and the failure of these means, when the symptoms depend upon the presence of a foreign body.

Symptoms, closely resembling those produced by foreign bodies in the air-tubes, may be caused by the lodgment and impaction of extraneous substances in the *pharynx* and *œsophagus*. This fact shows the importance, in all cases of doubt, of thoroughly examining the latter passages with the finger and probang before we attempt an operation for the relief of the patient, or before we rest satisfied that the obstruction is really in the windpipe. From a want of such precaution serious consequences might arise.

Finally, it is well known that, if a foreign body, such, for instance, as a piece of meat, or cartilage, is retained even for a short time in the œsophagus or fauces, the irritation occasioned by its presence will often remain for hours, if not days, after its removal. Such is the distress sometimes, under these circumstances, that it is very difficult to persuade the patient that the substance is not still in its original situation. As the same thing may occur when the foreign body is in the windpipe, the surgeon, unless fully on his guard, may be led into most serious error. Indeed, there is reason to believe that bronchotomy has occasionally been performed in such cases.

It is not always easy to determine, from a consideration of the history and symptoms of the accident, whether the offending substance is in the larynx, or in some other portion of the windpipe. Our knowledge upon the subject, indeed, is far from being satisfactory.

From an analysis of sixteen cases of foreign bodies in the *larynx*, I am led to conclude that, as a general rule, whenever there is aphonia, whether partial or complete, the substance is situated in this portion of the windpipe; at all events, there is a strong probability that this is the case, a probability which is converted into perfect certainty, if, conjoined with this symptom, there is pain, soreness or uneasiness in the region of the larynx, along with dyspnœa, a whistling sound in respiration, absence of serious disease in the bronchial tubes and lungs, and inability, on the part of the observer, to perceive the offending body moving up and down the trachea. It is important, however, in reference to this subject, to bear in mind that the voice may be seriously affected, and yet the foreign body not be lodged in the larynx, but in the trachea, or in one of the bronchial tubes.

When a foreign body descends into one of the *bronchial tubes*, the respiratory murmur in the corresponding lung is generally more or less affected. The wall of the chest, however, is not always, perhaps not even generally, dull or flat, as in pneumonia and phthisis, in which the parenchymatous substance of the organ is condensed by abnormal deposits; on the contrary, the sound is frequently unnaturally clear and resonant, very much, indeed, as in pulmonary emphysema. This peculiarity is sometimes recognized over the entire lung; while at other times it is limited to particular portions, as one-half, a third, or one-fourth, according to the size and situation of the foreign body. When the extraneous substance is so large as to obstruct the bronchial tube completely, there must necessarily be marked dulness on percussion, and great diminution, if not entire absence, of motion in the ribs.

The *respiratory murmur*, under the same circumstances, may be very much diminished, or wholly absent, according to the amount of the pulmonary obstruction. In most instances it is lessened only somewhat in intensity, because a certain quantity of air still enters the lung by the side of the foreign body. It is only when the extraneous substance is very bulky, or when the tube is completely closed by it, or partly by it, and partly by abnormal deposits, as mucus or lymph, that the respiratory murmur can be no longer recognized, or only in the most imperfect manner.

It has already been seen that the extraneous substance may change its place in consequence of the impulse which it receives during coughing, during violent expulsive efforts of the lungs, or even during the various movements of the body.

Thus, in one of my cases, the foreign body, a grain of corn, was impacted for upwards of a week in the right bronchial tube, when, all of a sudden, during a severe paroxysm of coughing, it passed over into the left, where it was discovered on the dissection. Its former presence on the right side was denoted not only by the alterations in the respiratory murmur and the extraordinary resonance on percussion, but by the peculiar pathological appearance of the mucous membrane in the corresponding bronchial tube. It should also be recollected that the changes in the respiration may be materially influenced, if not entirely masked, by the deposits produced by the irritation of the foreign substance; thus frequently divesting them of their diagnostic value.

The foreign body occasionally plays up and down the trachea, either in consonance with the respiratory movements, or in consequence of severe fits of coughing. During these changes, it is very apt to cause severe spasm and irritation by impinging against the mucous membrane of the larynx, sufficient, in some instances, to induce suffocation. In many of these cases the patient is rendered conscious of this occurrence, not only by the pain and spasmodic cough, but by the peculiar sensation which the substance produces as it passes up and down the windpipe. Sometimes, again, the extraneous body may be distinctly felt and even heard during these movements, as in an interesting case observed by Professor May. The patient was a child five years old, in whom the substance, a grain of corn, could be distinctly heard and felt at every expiration as it struck the upper part of the trachea.

Occasionally, the *noise* produced by the foreign body, or, more properly speaking, by the air as it rushes past it, is so peculiar that it may be regarded as pathognomonic of the nature of the accident. Sometimes the sound is of a whistling nature; at other times, it resembles a cooing rhonchus; and now and then it is a peculiar, flapping noise.

The preceding facts will, commonly, enable us to determine whether the foreign substance is firmly impacted in one of the bronchial tubes, or whether it is capable of moving up and down the trachea during coughing and respiration. As a general rule, the substance, whatever it may be, remains loose. This is often true in cases even of long standing, but it is particularly so of recent ones, before the occurrence of much secretion, tending to attach the foreign body or to impair its mobility, and before the development of serious structural lesion, as, for example, the formation of an abscess, in which the body may become permanently imprisoned. When we add to the above facts the absence of all laryngeal disease, and the unaffected state of the voice, the conclusion will be inevitable that the intruder is lodged in one of the bronchial tubes, or alternately in one of these tubes and in the trachea.

I do not think it is possible to determine, from anything we know, whether a foreign body is permanently arrested in the trachea. The number of such accidents is exceedingly limited, and the phenomena attending them have been studied with too little attention to justify us in deducing from them any special conclusions.

Spontaneous Expulsion.—Almost every possible variety of substance, capable of entering the windpipe, may be spontaneously expelled. In my Treatise on Foreign Bodies in the Air-Passages, I have given the particulars of numerous cases illustrative of the subject. Among the more ordinary substances may be mentioned cherry-stones, nuts and fragments of their shells, water-melon seeds, beans, grains of corn and of coffee, bits of bone, nails, and tacks; among the more uncommon, teeth, pieces of coin, bullets, cockle-burs, and ears of grass and grain. Professor Hamilton has communicated to me the particulars of an instance in which a tin whistle was spontaneously ejected. Nunn, Colles and Heustis have, respectively, reported cases in which riddance was thus effected of a puff-dart, a pop-gun, and a piece of feather nearly two inches in length.

The expulsion usually occurs in a paroxysm of coughing, and the effort is no doubt greatly facilitated by dependency of the head, as when it is hanging over the edge of a bed. In forty-nine cases, tabulated in the work above referred to, riddance was effected, in this manner, in thirty-seven; in one in sneezing; in one in dreaming; and in one in spontaneous vomiting; the mode of expulsion the history of the case, and the prompt relief which usually follows the exhibition of anthelmintic remedies, when the affection is of a verminous character; and the failure of these means, when the symptoms depend upon the presence of a foreign body.

Symptoms, closely resembling those produced by foreign bodies in the air-tubes, may be caused by the lodgment and impaction of extraneous substances in the *pharynx* and *œsophagus*. This fact shows the importance, in all cases of doubt, of thoroughly examining the latter passages with the finger and probang before we attempt an operation for the relief of the patient, or before we rest satisfied that the obstruction is really in the windpipe. From a want of such precaution serious consequences might arise.

Finally, it is well known that, if a foreign body, such, for instance, as a piece of meat, or cartilage, is retained even for a short time in the œsophagus or fauces, the irritation occasioned by its presence will often remain for hours, if not days, after its removal. Such is the distress sometimes, under these circumstances, that it is very difficult to persuade the patient that the substance is not still in its original situation. As the same thing may occur when the foreign body is in the windpipe, the surgeon, unless fully on his guard, may be led into most serious error. Indeed, there is reason to believe that bronchotomy has occasionally been performed in such cases.

It is not always easy to determine, from a consideration of the history and symptoms of the accident, whether the offending substance is in the larynx, or in some other portion of the windpipe. Our knowledge upon the subject, indeed, is far from being satisfactory.

From an analysis of sixteen cases of foreign bodies in the *larynx*, I am led to conclude that, as a general rule, whenever there is aphonia, whether partial or complete, the substance is situated in this portion of the windpipe; at all events, there is a strong probability that this is the case, a probability which is converted into perfect certainty, if, conjoined with this symptom, there is pain, soreness or uneasiness in the region of the larynx, along with dyspnœa, a whistling sound in respiration, absence of serious disease in the bronchial tubes and lungs, and inability, on the part of the observer, to perceive the offending body moving up and down the trachea. It is important, however, in reference to this subject, to bear in mind that the voice may be seriously affected, and yet the foreign body not be lodged in the larynx, but in the trachea, or in one of the bronchial tubes.

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The time at which the expulsion occurs varies from a few hours to many years. In a case reported to me by Professor Flint, nearly three years elapsed; and in another, for which I am indebted to Dr. Wulkupf, the interval was upwards of eleven years. In general, it will be found that the patient recovers after riddance has been effected; but, now and then, he perishes from the injury sustained by the sojourn of the foreign substance, as inflammation of the lung, or of the lung and pleura. In the case mentioned by Lescure, in which the foreign body, a piece of bone, was expelled at the end of seventeen years, death occurred eighteen months after the event, from disease of the pulmonary tissues. On the other hand, the lungs may be greatly disorganized by the foreign substance, and yet not cause death after riddance has been effected. In a case which came under my observation, many years ago, in a boy upwards of eleven years of age, gangrene of this organ, eventuating in the formation of a large cavity, occurred, followed by complete recovery.

The expulsion usually takes place by the glottis; but now and then through the walls of the chest. In the former case, the substance generally escapes by the mouth; sometimes with a good deal of force, in a violent expiratory effort. In children the substance is occasionally swallowed, thus creating a painful state of uncertainty in regard to its disposition, which is, perhaps, only relieved by finding it in the alvine evacuations.

Treatment.—The treatment of foreign bodies in the air-passages is medical and surgical; the former being intended to protect the patient from suffocation and disease of the respiratory organs, the latter to effect riddance of the intruder.

An individual who has a foreign body in his windpipe should be regarded as an invalid, unfit to leave his room, or to attend to business. The treatment, in the early stage of the complaint, should be limited to a general supervision of the patient's health; that is, his diet should be carefully regulated, the bowels moved from time to time with mild purgatives, and the temperature of the apartment uniformly maintained at about 75° of Fahrenheit. The chest should be thoroughly examined at least once a day by auscultation and percussion, to ascertain the condition of the lungs and bronchial tubes. Cough should be subdued by mild expectorants, containing, if there are frequent spasms, a suitable quantity of morphia. If symptoms of pneumonia, bronchitis, or pleuro-pneumonia supervene, they must be promptly met by the ordinary remedies, particularly the lancet, active purgatives, and tartar emetic, in conjunction, if necessary, with leeches and blisters. By watching the patient in this way, the respiratory organs may be protected from mischief, and the extraneous substance be expelled spontaneously; or, should an operation become necessary, he will be in a much better condition to undergo it with impunity.

The expulsion of the foreign body does not always secure immunity from danger. The air-passages, irritated by its presence, may have taken on inflammation before its extrusion, or this action may be set up soon after, and in either case the danger to life may be very great. A knowledge of this fact is of great practical importance, and cannot be too strongly inpressed upon the mind of the attendant.

It would seem reasonable, at first sight, to suppose that *emetics* would be beneficial in expelling foreign bodies from the windpipe, but experience has shown that they are not only useless, but often dangerous, by impelling the intruder into the larynx, and thus causing violent spasm of the glottis. Besides, their employment may occasion loss of valuable time. In forty-six cases, analyzed by me, in which various emetic articles were exhibited, there was not one in which they were of any material service, while in quite a number they were positively injurious. Their use should, therefore, be discountenanced.

Sternutatories of every description, mild and harsh, vegetable and mineral, have been employed, with a view of aiding the expulsion of the intruder, but, with the exception of the case related by Boyer, in which the nose was tickled with snuff, while the patient was partially asleep, no relief followed their use. It is possible that this class of remedies might occasionally be beneficial, if conjoined with the use of chloroform. The proper plan would be to make the patient inhale the fluid until he is nearly insensible, and to irritate the Schneiderian membrane with snuff or some other substance the moment he begins to regain his consciousness. Should sneezing ensue while he is in this condition, with the air-tubes in a state of perfect relaxation, it is easy to conceive that the foreign body might be ejected. Nature would be taken, as it were, by surprise, as she has sometimes been by a dream, as in the remarkable case of Mr. Cock.

A very interesting case, in which a piece of fish-bone was expelled from the windpipe under the influence of the inhalation of iodine, occurred in 1832, in the practice of Mr. Day.

Inversion of the Body.—This operation, as the name implies, consists in suspending the patient by the heels, or in securing his body, with the head inclined downwards, to a chair, narrow table, or other suitable object. While in this position, the chest and back are repeatedly and smartly struck with the hands, to aid, first, in dislodging the offending substance, and, next, in propelling it through the glottis, or, in case of bronchotomy, through the artificial opening in the neck. With the same view, the thorax is sometimes suddenly and forcibly compressed, the patient having previously taken a full inspiration. The object of this manœuvre is to empty the lungs as rapidly and completely as possible, in order that the air, as it rushes through the windpipe, may carry the intruder before it. The compression is usually effected with the hands, applied at opposite points of the trunk; but, perhaps, a better method is to make it with a broad bandage, arranged so as to encircle the chest, and slit at the ends, after the fashion of the bandage used in tapping the abdomen. The patient, having taken a full inspiration, the extremities of the bandage are suddenly drawn in opposite directions, thereby compressing the thoracic walls equably and forcibly at every point.

The great objection to this operation is the risk which the patient incurs from suffocation, occasioned by spasm of the glottis, from the contact of the extraneous body in its attempt to pass through the larynx. The only way of preventing this is either to administer chloroform, or, what is preferable, to open the windpipe as a preliminary measure. By this procedure, all danger of producing spasm of the glottis will be removed, and the foreign body will have a chance of escaping either through the larynx, or at the wound in the neck. Without this precaution, inversion of the body, unless practised with the greatest possible care, may be attended with very serious, if not fatal, consequences.

In the interesting case of Brunel, recorded by Sir B. C. Brodie, inversion invariably produced the most distressing coughing, with symptoms of impending suffocation, compelling the experimenter at once to desist. The object was, by permitting the patient's head and shoulders to hang over a chair while the body was in the prone position, to afford the extraneous substance, a half-sovereign, an opportunity of slipping through the rima of the glottis into the mouth. During every effort of this kind, there was a distinct perception of a loose substance passing forward along the trachea, and striking against the larynx. Tracheotomy was afterwards performed, and an attempt made, but in vain, to extract the coin with the forceps. Finally, at the expiration of the sixteenth day after the operation, the patient's body and shoulders were secured to a peculiar contrivance, a sort of platform, made movable on a hinge in the centre, and so arranged as to permit the head to be brought to an angle of about 80° with the horizon. The back being now struck with the hand, severe coughing ensued, followed almost immediately by the ejection of the intruder.

Operative Interference.—Convinced that no person with a oreign body in the air-passages can be for a moment free from the danger of suffocation, I am very decidedly of opinion that no time should be lost in opening the windpipe. I am acquainted with the history of quite a number of cases in which life was destroyed by waiting in the vain hope that spontaneous expulsion might occur, and thus obviate the necessity of surgical interference. A violent cough coming on, the patient may drop down in a fit of unconsciousness, from spasm of the glottis, and be instantly choked to death. Now, although the operation may not be immediately followed by the escape of the foreign body, it will at least effectually prevent spasm of the glottis, and thus afford the extraneous substance an opportunity of being extruded either by the natural or artificial route. The patient has thus two chances of coughing it up, whereas, before, he had hardly one, the contraction of the muscles of the larynx constantly acting as a barrier to its escape. Even when the wound finally closes, without the foreign body being expelled, the operation may have been of the greatest possible benefit in preventing suffocation.

The operation which is usually performed is tracheotomy, as it affords much easier access to the foreign body than laryngotomy, as well as a much better chance for its spontaneous expulsion. The latter operation, however, should always be selected when it is certain that the substance is impacted in one of the ventricles of Morgagni, unless the patient is a child, with a very short, thick neck, rendering it difficult to obtain a sufficiency of room for the easy introduction of instruments. The incision in the trachea may occasionally be advantageously prolonged into the larynx, and conversely. In laryngotomy it is sometimes extended upwards through the greater portion of the thyroid cartilage. The manner of executing these operations, for this and other purposes, will be described under a distinct head. Meanwhile, it may be observed that, when they are performed for the removal of foreign bodies, the patient should always take chloroform or ether, and that the whole procedure should be conducted in the most careful and deliberate manner.

The moment the operation is completed, the patient is turned upon his abdomen, with the face towards the floor. The object of this procedure is to relax the edges of the wound, so as to afford a freer passage for the escape of the foreign body, and also for the discharge of any blood that may have accidentally entered the windpipe. If the patient is partially asphyxiated, the edges of the opening should be held asunder with a pair of polyp-forceps. In a case of this kind lately under my charge, the foreign body, a large pebble, was projected into the blades of the instrument, while in this position, and at once extracted. Its size was such as almost to close the trachea, and the child, who was only three years of age, evidently had not the power to expel it.

If the substance is not speedily ejected, the best plan is to invert the patient's body, and to strike the chest with the hand, or with a pillow. This procedure should be tried in all cases of balls, shot, pebbles, peas, beans, water-melon seeds, plum-stones, cherry-stones, button-moulds, and similar articles. Inversion of the body, with previous opening of the tube, is a comparatively safe operation. Succussion and percussion are important auxiliaries in such an event.

If these measures fail, search should be made for the substance with the forceps, or hook, with a view to its extraction; but all such attempts must be conducted in the most gentle manner, nor should they be prolonged beyond a few seconds at a time, inasmuch as they almost invariably excite violent coughing and suffocative feelings. The use of chloroform and the bending of the head will greatly facilitate this step of the procedure.

The foreign body, both in laryngotomy and tracheotomy, may escape either at the artificial opening or by the glottis. In either case it may be thrown to a considerable distance, perhaps the very moment the tube is pierced; or it may be intercepted by the edges of the wound; or it may, if it take the natural route, lodge in the mouth, or pass into the stomach.

Great care is taken not to permit any blood to enter at the artificial opening, as the smallest quantity may not only induce violent cough and spasm, but instant suffocation. Should the accident be unavoidable, the patient must immediately be turned upon his abdomen, and, if necessary, the blood must be sucked out of the tube with the mouth. It is worthy of remark that the thyroid veins, which are generally so much distended in consequence of the difficulty of breathing and the struggles of the patient, often cease to bleed the moment the windpipe is opened and the air is freely admitted into the lungs.

When the patient is asphyxiated, whether by spasm of the glottis or the presence of blood in the windpipe, the only resource is artificial respiration, steadily and diligently maintained until there is reason to believe that life is completely extinct. In a remarkable case observed by Dr. J. F. May, of Washington, the artificial respiration was kept up for half an hour before the child, a boy nearly three years old, evinced signs of returning life. The air may be introduced by the application of the operator's mouth, or, what is far better, by means of a gum-elastic tube, inserted through the wound in the trachea.

When the extraneous body refuses to escape, or resists the efforts at removal, the edges of the tracheal wound should be kept apart by means of blunt hooks, in order to favor extrusion. No canula should be inserted, as it would seriously interfere with the expulsion of the extraneous substance. The outer wound should be covered, in this case, with a piece of gauze, arranged in the form of a bag, to prevent the ingress of flies and dirt.

Riddance having been effected, the wound is closed with adhesive strips, aided, if necessary, by a few interrupted sutures, care being taken not to carry them through the substance of the trachea. Simple water-dressing is the best application, but even this may, in general, be omitted.

The after-treatment must be strictly antiphlogistic; the respiratory organs must be diligently watched; and the air of the patient's apartment must be both moist and warm, the temperature being steadily maintained at 80° to 85° of Fahrenheit. Should difficulty of deglutition supervene, as often happens from the third to the fifth day, it will be proper to avoid the use of fluids, inasmuch as they will have a tendency to enter the windpipe in consequence of the impaired condition of the epiglottis. No patient is safe, or out of danger, after this accident, so long as there is inflammation of the respiratory passages, whether the intruder has been expelled or not.

Bronchotomy does not always insure the speedy expulsion of the offending body; on the contrary, cases not unfrequently arise where the only apparent good from it is the relief which it affords from spasm of the glottis, the extraneous substance being, perhaps, either permanently retained, or, at any rate, not ejected until some time afterwards, occasionally, indeed, not until the wound is entirely cicatrized, as happened in one of my own patients. On this account it might become necessary to perform the operation a second, and even a third time.

Instruments.—Various instruments have been contrived for effecting the dislodgment and removal of foreign bodies. Of these, a few of the most eligible and important require particular notice.

1. Fig. 270, represents a pair of forceps, constructed for me by Mr. Kolbe, after a model of my own. They are composed of German silver, and are a little upwards of eight inches in length. The handle is considerably curved on the flat, and has two large rings for the thumb and finger. The blades, which are rounded and very slender, are five inches long, and terminate each in a fenestrated extremity, nine lines in length by three lines in width, the outer surface being smooth and convex, the inner flat and slightly serrated. The great advantages of this instrument are, first, that it may be used with equal facility as a probe and an extractor; secondly, that it may be bent at any point and in any direction, according to the pleasure of the operator; and, thirdly, that it cannot possibly seriously impede the passage of the air, during the attempts which are necessary to explore the windpipe for ascertaining the precise situation of the foreign substance.

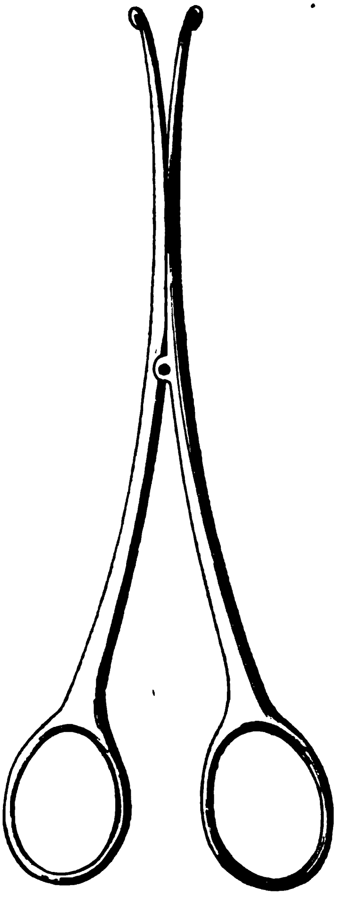
Fig. 270.

The author's trachea forceps.

2. The forceps represented in fig. 271 are intended for holding apart the edges of the wound in the trachea, while the surgeon attempts to extract the foreign substance with other and more suitable instruments, introduced between their expanded blades. I have repeatedly found them very serviceable.

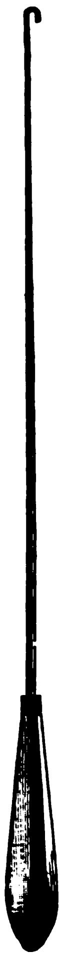
3. Fig. 272 represents a long slender hook, composed of silver, and well adapted for extracting foreign bodies, as beans, grains of corn, coins, prune-stones, pebbles, and bits of bone, situated in the inferior portion of the trachea, or in one of the bronchial tubes. The curved part of the instrument is very short and blunt at the extremity.

Fig. 271.



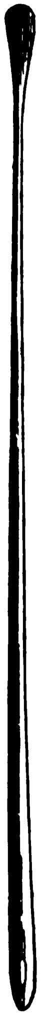
Trousseau's forceps.

Fig. 272.



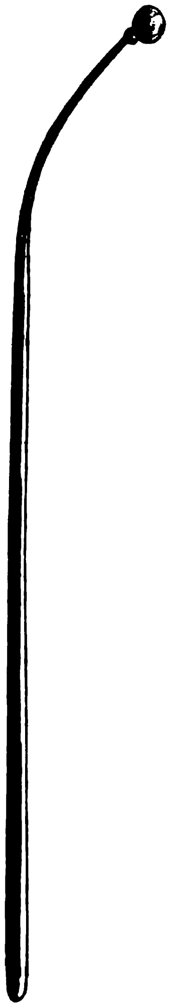
Blunt hook.

Fig. 273.



Probe.

Fig. 274.



Sponge mop.

4. For exploring the air-passages, or dislodging foreign bodies from the larynx, especially the ventricles of Morgagni, hardly anything better could be imagined than the probe sketched in fig. 273. It is about nine inches in length, bulbous at the extremity, and being composed of silver, any curve may be imparted to it that may be desirable.

5. The instrument delineated in fig. 274 is merely a whalebone probang, bent at an angle of about 45°, and surmounted at its extremity by a small piece of

very soft sponge. It is admirably adapted for removing extraneous matter from the larynx, and should find a place in every surgeon's drawer.

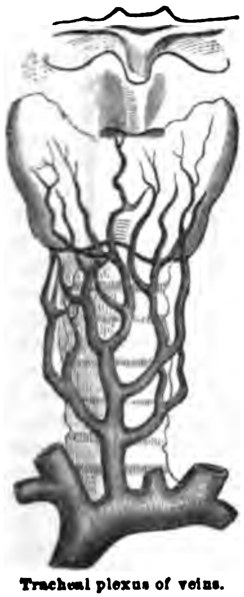
6. Another instrument which the operator should have at hand, especially when the extraneous body is impacted in one of the ventricles of the larynx, is a flexible, grooved director, such as is usually found in the common pocket case. The scoop-shaped extremity may be used with great advantage under such circumstances, particularly if it is slightly bent.

7. In a case recently under the care of Dr. John L. Atlee, the foreign body, consisting of a piece of clay pipe-stem, an inch and a half long, was readily seized and extracted with a pair of Toynbee's ear forceps, one of the blades of which happily slipped into the interior of the tube, and thus enabled the operator to take a firm hold of it. The patient, a child four years of age, recovered without an untoward symptom.

Difficulties.—The difficulties experienced in these operations, especially in tracheotomy, arise chiefly from the imperfect manner in which the patient's head is held, extraordinary shortness and thickness of the neck, uncommon turgescence of the cervical vessels, or irregularity in their distribution, ossification of the rings of the trachea, enlargement of the thyroid gland, and, finally, the occurrence of hemorrhage. These difficulties may usually be easily obviated by proper care. The rule is never to cut anything that can be avoided, but to hold it out of the way. Should any vessels be accidentally opened, they must immediately be ligated.

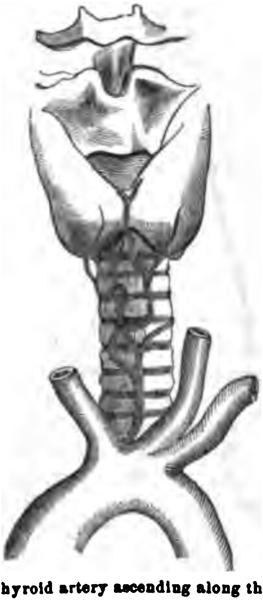
In laryngotomy, the only artery at all in danger of being wounded is a small branch of the superior thyroid, which traverses the crico-thyroid ligament, and which, in the adult, is about the size of a crow-quill. In tracheotomy, the bleeding may proceed from the tracheal *plexus of veins*, fig. 275, or from the *middle thyroid artery*, fig. 276, given off either by the innominate or the common carotid; in some instances it is double, one offset being derived from the former, and the other from the latter, vessel. In a preparation in the possession of Dr. S. W. Gross, the middle thyroid arises from the left subclavian, about three-quarters of an inch in front of the thyroid axis.

Fig. 275.



Tracheal plexus of veins.

Fig. 276.



Middle thyroid artery ascending along the trachea.

Although the hemorrhage in tracheotomy is usually insignificant, it may occasionally be very profuse, if not fatal; only so, however, in the hands of an ignorant, timid, or inexperienced operator. I have heard of at least half a dozen cases of death from this cause. Occasionally quite a considerable flow of blood is produced by the division of the mucous membrane, especially when it is in a state of congestion, or inflammatory irritation, as it is apt to be when the foreign body has been retained for any length of time. The hemorrhage will then, of course, be internal, and may proceed to such an extent as to induce the most serious impediment in the respiratory functions. When such an occurrence is threatened, the patient should instantly be placed upon his face, in order that the fluid may escape at the artificial opening as fast as it is effused.

Finally, in opening the trachea, it should be borne in mind that the innominate artery and vein may ascend unusually high up in the neck, or that they may cross this tube in such a manner as to incur the risk of being wounded by the incautious use of the knife.

Contra-indications.—Under no circumstances should bronchotomy be performed without a thorough exploration of the chest and œsophagus. It should be remembered that mere spasm of the glottis, caused by the lodgment of a foreign body in the fauces or gullet, or by derangement of the digestive, respiratory, and nervous systems, may induce a train of phenomena closely resembling those occasioned by the presence of a foreign body in the air-tubes.

An important question here presents itself: At what period after the occurrence of an accident of this kind should an operation be considered as improper? Or, more correctly speaking, what are the circumstances which contra-indicate a resort to the knife? It must be obvious that the mere lapse of time should not be taken into the account in the decision of such a question; for it is well known that one individual may experience as much damage from the presence of a foreign body in a week as another may in a month or a year. Thus, to particularize, the lungs may become seriously diseased, if not partially disorganized, in a few days, in one case, while in another they may suffer little, if indeed at at all, during any stage of the accident. Hence, it should be a rule with the practitioner, in every instance of the kind, to institute, as a preliminary step, a careful and thorough examination of the chest, with a view of ascertaining the precise condition of the respiratory apparatus. If this is found to be healthy, or even comparatively healthy, an operation, all other things being equal, would not only be justifiable, but highly proper, whatever length of time might have elapsed since the inhalation of the extraneous substance; if, on the other hand, it is seriously diseased, the knife should be studiously withheld, certainly temporarily, if not altogether, on the ground that the artificial opening would be very likely to complicate the morbid action, and thereby enhance the danger both to the part and to the system. I should certainly not consider it proper to operate upon an individual who, in consequence of having inhaled a foreign body, was laboring under violent pneumonia, a large abscess, or extensive tubercular deposits. To employ the knife, in such an event, could hardly fail to injure the patient and to throw discredit upon surgery.

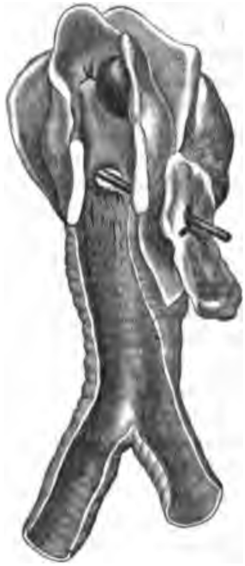
Mortality from Foreign Bodies.—Some very interesting statistical facts have been furnished upon this subject by the collection of the recorded cases of foreign bodies in the air-passages, illustrative both of the nature of spontaneous expulsion, and of the effects of bronchotomy. In the work already several times alluded to, I have recorded the particulars of 159 cases, in which spontaneous ejection took place in 57, 8 terminating fatally. Inversion of the body alone was successful in 5 cases, and unsuccessful in 6. Of 68 cases of tracheotomy, 8 died, and 60 recovered. Of 17 persons upon whom laryngotomy was performed, 13 lived, and 4 died. Laryngo-tracheotomy was practised in 13 cases; in 10 the operation was followed by recovery, and in 3 by death. Thus, of the 98 cases in which the windpipe was opened for the removal of foreign bodies, 83 were successful and 15 fatal, or in the ratio of about 5½ to 1.

Of the three operations performed upon the above cases, that of tracheotomy affords the most favorable results, the recoveries being in the proportion of 8¼ to 1 death; whereas, in the other two, the mortality of each was twice as great. All these operations are, other things being equal, more successful the earlier they are performed, as there is then less disturbance of the respiratory organs.

The causes of death after bronchotomy are various. The most common, undoubtedly, is inflammation of the lungs, which, as has already been seen, is liable to arise at various periods after the accident, and which often makes great, if not destructive, progress before the operation is performed. When death results from this cause, it may take place soon after the windpipe is opened; or, as is, perhaps, more generally the case, it may be postponed for a considerable time; until, in fact, the wound made in the operation shall have been completely cicatrized.

Death is sometimes occasioned by an inordinate deposit of mucus at the former seat of the foreign body, or in its immediate vicinity; it may also be produced by apoplexy of the brain, and by hemorrhage into the air-passages.

Fig. 277.



Perforation of the larynx.

The adjoining sketch, fig. 277, for which I am indebted to Dr. John Brinton, illustrates a very singular case of foreign body in the larynx, which I saw with him in October, 1856, in a boy, nine years old, who, on the evening of the 24th of September, had inhaled the shell of a chinkapin. The symptoms being urgent, tracheotomy was performed the next day, but no extraneous substance could be detected anywhere by means of the probe. Nearly three weeks after the accident, Dr. Brinton, satisfied that he had discovered the situation of the shell, enlarged the wound, which had been all along kept open with hooks, by dividing the cricoid cartilage and the crico-thyroid membrane. Again, however, nothing of a reliable nature was found, notwithstanding a large probe was repeatedly pushed up into the fauces. The boy experienced some benefit from the operation, and was for awhile even under the impression that he had swallowed the intruder. He progressed favorably enough until the 5th of November, except that he had occasionally a spasmodic attack, which he was in the habit of relieving by holding the edges of the wound temporarily apart with a pair of curved forceps. At the time here alluded to, having a more violent paroxysm of dyspnœa than usual, he thrust the instrument forcibly through the posterior and lateral wall of the trachea, and, in the act of doing so, ruptured a small artery, the blood of which, descending into the trachea, caused instant suffocation.

The shell, on dissection, was found to be firmly imbedded in the right ventricle of the larynx, a portion being hooked round the inferior vocal cord; it was three-quarters of an inch in length by four lines in width, was covered over with bands of lymph, and could not be detected by the probe carried upwards through the wound in the neck. An opening, the result, doubtless, of ulceration, existed in the posterior and lateral wall of the larynx, through which the boy had pushed the forceps so as to cause the fatal hemorrhage. The trachea was completely filled with blood.

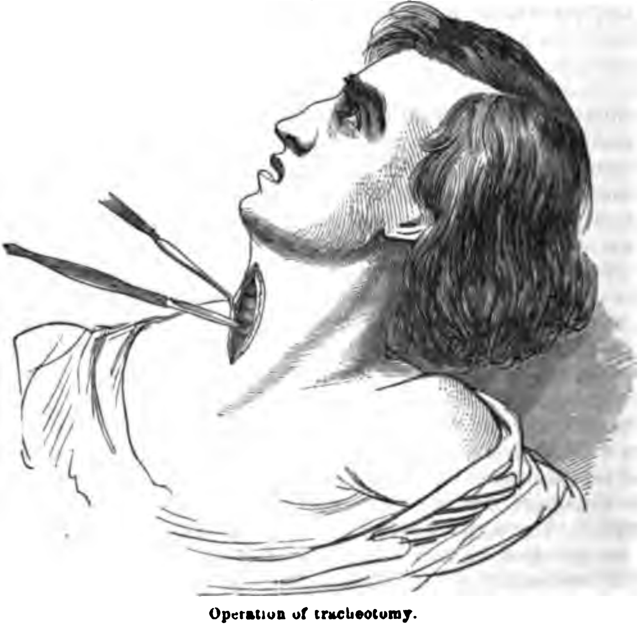
14. BRONCHOTOMY.

Under this denomination are included the three operations known, respectively, as laryngotomy, tracheotomy, and laryngo-tracheotomy. These operations may be rendered necessary by the following circumstances:—1. The presence of foreign bodies in the air-passages. 2. Spasm and œdema of the glottis. 3. Ulceration, scalds, and contusions of the larynx. 4. Polypous growths. 5. Laceration of the windpipe. 6. Tonsillitis and retro-pharyngeal abscess. 7. Impacted matter in the œsophagus. 8. Suspended animation. 9. Carotid aneurism. 10. Membranous croup, diphtheria, erysipelas of the fauces, and smallpox of the larynx.

Laryngotomy.—Laryngotomy is a very simple and easy operation. The only structures that are divided are the skin, the cervical fascia, and the crico-thyroid membrane. If the patient is an adult, he may sit upon a chair, or, what is preferable, especially if he take chloroform, lie upon a narrow table, the head and shoulders being properly elevated and horizontalized by pillows. If, on the contrary, he is a child, he should be supported upon the lap of an assistant, his body and limbs being securely fastened with an apron, very much as in the operation for hare-lip. The head, thrown backwards, is held by another assistant, in such a manner as to render the parts unusually prominent and make the chin look directly forwards. With a small, narrow scalpel, the surgeon, stationed in front of the patient, if he sits, or by his side if he is recumbent, carries an incision along the centre of the larynx, from the top of the thyroid cartilage to the base of the cricoid. In the adult, the length of this incision is fully one inch and a half, and hardly any less in a thick, short necked child. It embraces the skin and cervical fascia, and usually also the crico-thyroid artery. Should this vessel bleed, it must either be forcibly twisted or secured with the ligature, lest the blood should find its way into the windpipe, and thus occasion severe cough, if not suffocation. The crico-thyroid membrane is now divided, in its whole extent, in the direction of the cutaneous wound. Should the opening not be sufficiently large, the incision may be prolonged into the contiguous cartilages, or a piece of the membrane may be cut away on each side of the wound. Some surgeons prefer making a crucial incison, and such a proceeding is quite proper when it is desirable to afford free play to the instruments without interfering with the thyroid and cricoid cartilages.

Tracheotomy.—If the operation of laryngotomy is simple and easy, it is far different with that of tracheotomy. This is particularly true with regard to tracheotomy in children with short, thick necks, to say nothing of the cries and struggles which they are sure to make if they are not under the influence of chloroform, or nearly choked by the foreign body. The use of anæsthetic agents, however, greatly facilitates the operation, and divests it of much of the dread which surgeons have always so justly entertained respecting it.

Fig. 278.



Operation of tracheotomy.

In performing tracheotomy, fig. 278, the same general rules are to be observed as in laryngotomy. An incision is made through the common integuments, directly along the middle line, extending from the base of the cricoid cartilage to within a quarter of an inch of the top of the sternum. The opposite sterno-hyoid and sterno-thyroid muscles are next separated from each other at their raphe, by a cautious use of the handle of the knife, aided, if necessary, by the point of the instrument, when the cervical fascia and the thyroid plexus of veins will be fully brought into view. The former is divided in the same careful manner, while the latter is pushed aside, and protected by a blunt hook. If the middle thyroid artery is cut, which, however, is a rare contingency, it must instantly be secured. The isthmus of the thyroid gland, even when it descends unusually low, will seldom occasion any serious embarrassment; should it do so, it must be held out of harm's way, or be included in two ligatures, and then divided along the middle line, otherwise copious hemorrhage may ensue.

Satisfied that there is no blood at the bottom of the wound, the surgeon steadies the trachea with the left index finger, or, what is better, with a tenaculum, and divides at least three of its rings. In executing this step of the operation, the knife is entered at a right angle to the surface of the tube, with its back towards the sternum, care being taken to cut from below upwards, lest injury be inflicted upon the great vessels at the root of the neck. The incision in the trachea must strictly correspond with the centre of the external wound, and should be at least an inch in length. If shorter than this, it will scarcely suffice for the spontaneous ejection of the foreign body, or, when this does not happen, for the proper play of the forceps.

Laryngo-tracheotomy.—In performing laryngotomy, it not unfrequently happens that the opening afforded by the division of the crico-thyroid membrane is inadequate for the purpose for which it was made. In this event it may very readily be enlarged to the requisite extent, by dividing the cricoid cartilage and one or two of the upper rings of the trachea. The operation, thus performed, has been denominated laryngo-tracheotomy, as denotive of the parts concerned in it. The chief objection to it is the danger of wounding the isthmus of the thyroid gland, and the branch of the superior thyroid artery which so frequently courses along its upper border. When the foreign body is so firmly impacted in the larynx as to render it impossible to remove it by the ordinary operation, we may divide the thyroid cartilage in its whole length along the middle line.

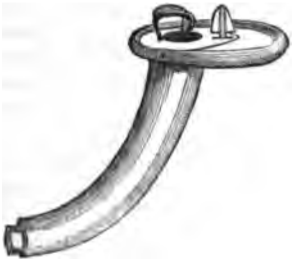
15. INTRODUCTION OF TUBES.

The introduction of tubes into the windpipe becomes necessary whenever that canal is opened for the purpose of promoting the ingress of the air, in cases of mechanical obstruction, however induced. The only exception to this rule is, or should be, when the respiratory difficulty is occasioned by the presence of a foreign body in the air-passages, and where, consequently, a tube, worn in the trachea, might interfere with the expulsion of the substance.

Tubes of this kind are generally made of silver; they should possess the qualities of lightness and of accurate adaptation to the parts which they are destined to serve. Their length varies from an inch and a half to two inches and a quarter, according to the stature of the patient, and their diameter should be such as to admit of easy introduction, without at all encroaching upon the surface of the windpipe. Their shape is cylindrical, with a slight antero-posterior curvature, the concavity of which is directed forwards. The superior extremity of the instrument is provided with two rings, for the passage of tapes, which, being tied at the back part of the neck, secure it firmly in its place.

Most instruments of this kind are now made double, as seen in fig. 279, the inner one, which is nearly a fourth of an inch longer than the outer, being so constructed as to admit of easy removal for the purposes of cleanliness. This is a matter of paramount importance, as the tube soon becomes clogged with thick, tough, adherent mucus, thus rendering frequent withdrawal absolutely indispensable. Meanwhile the outer instrument, or sheath, being retained, the introduction of the inner is thereby much facilitated; so that, in fact, the operation may readily be intrusted to any intelligent nurse, or even, in some cases, to the patient himself. The two tubes are fastened together by a button. The breathing orifice should always be carefully covered with a piece of gauze to prevent the ingress of flies and other extraneous substances.

Fig. 279.



Trachea tube.

When a tube is intended to be worn in the larynx, it will generally be necessary to remove an elliptical section of the crico-thyroid membrane, in order to afford sufficient room for its accommodation. Occasionally, the object may be attained by a large crucial incision.

The length of time during which such an instrument should be worn must, of course, depend upon circumstances, or, more properly speaking, the necessity which led to its introduction. In some instances it may be dispensed with in a very short time, while in others it may require to be retained for years, if not during the remainder of life. In acute disease the tube should not be removed until all danger of suffocation is passed, as the wound, in general, rapidly contracts, and might thus lead to a return of dyspnœa. Whenever the patient wishes to speak, he must place his finger upon the orifice of the instrument.

When bronchotomy is performed for the relief of croup, diphtheria, and similar affections, the windpipe should not be sucked, with a view of promoting respiration, without the precaution of washing out the mouth and throat well, immediately after, with a strong solution of chlorinated soda, or some other disinfecting fluid, for the purpose of promptly neutralizing the poison contained in the secretions of the parts. For the want of this precaution, several valuable practitioners have recently lost their lives, while a number of others have severely suffered without fatal consequences.

CHAPTER X.

INJURIES AND DISEASES OF THE NECK.

SECT. I.—WOUNDS.

Although wounds of the neck are treated upon the same general principles as wounds in the other parts of the body, yet they possess certain peculiarities which render it necessary that they should be noticed separately. Of these peculiarities the most important are hemorrhage, inflammation of the air-passages, emphysema, inanition, and the occurrence of fistule.

In regard to their character, wounds of the neck may be incised, contused, lacerated, punctured, and gunshot, precisely as in other regions of the body. In their extent, they vary from the merest scratch to almost complete severance of the neck, involving, of course, in the latter case, muscles, fasciæ, nerves, and vessels, along with the windpipe and œsophagus. The most frightful injuries of this description are generally inflicted in attempts at suicide, and yet, strange to say, these attempts are often entirely abortive, depending upon the fact that most persons, intent upon self-destruction, select the upper part of the neck, in the belief that suffocation will speedily ensue simply by opening the larynx. The consequence is that, although the gash may be most horrible, yet, the large vessels and nerves escaping, the patient not unfrequently makes a good recovery.

The sources of *hemorrhage* in wounds of the neck vary according to the situation of the injury. When the knife is drawn deeply across the lower cervical region, the bleeding usually proceeds from the carotid artery and jugular vein; when the larynx is involved, the thyroid vessels generally furnish the blood, while high up, as when the lesion occupies the interval between the hyoid bone and the chin, the hemorrhage is derived from the lingual artery. It has been doubted whether the windpipe and œsophagus could be completely severed without injury of the carotid artery and jugular vein; but the possibility of the occurrence has been attested by several well authenticated cases.

The hemorrhage attending wounds of the neck may be almost instantaneously fatal, especially when it proceeds from the large vessels; or, the patient fainting, a temporary stop may be put to it until the surgeon has time to apply a ligature. Not unfrequently death is occasioned by the blood flowing into the air-passages, and so causing suffocation, even, perhaps, when no important artery has been laid open, or, if laid open, after it has been tied. In wounds of the cervical veins, the patient sometimes perishes suddenly from the admission of air. A remarkable case has been related by S. Cooper, of a soldier who was almost instantly suffocated by the pressure of a large quantity of blood that had been effused between the integuments and the trachea. The hemorrhage, caused by a gunshot wound of the internal jugular vein, was entirely subcutaneous. The ball had entered behind the mastoid process, and passed obliquely downwards and forwards towards the sternum. Sometimes, again, the event is brought about by secondary hemorrhage, at the distance of a number of days or several weeks from the receipt of the injury.

The *treatment* of hemorrhage of the neck consists in ligating the affected vessels, whether arterial or venous. The internal jugular vein has been successfully tied in numerous instances. Dr. Morgan, formerly of Geneva, met with a case in which this vessel was partially severed by a razor, and which was saved by means of the ligature. Analogous examples have been reported by Stevens, Gibson, and other surgeons. When the internal jugular vein is inaccessible to the ligature, the wound should be plugged with pieces of sponge or patent lint, supported by adhesive strips and a roller, the head being maintained in an easy, elevated position.

Wounds of the *windpipe* are, in themselves, not particularly dangerous, but they nearly always become so, in consequence, as already stated, of the intromission of blood, thereby threatening suffocation, and of the remarkable susceptibility of the lungs, after such lesions, to inflammation. These, then, are the great sources of peril in cases of this description, and too much vigilance cannot be exercised in guarding against their occurrence. When the tube is completely severed, the danger is, of course, imminent, death usually following in a short time from suffocation from the ingress of blood. In a case recently communicated to me by Dr. James D. Maxwell, of Indiana, a child, twelve years of age, lived fifteen days in this condition. The windpipe had been completely severed between the cricoid and thyroid cartilages. The œsophagus had also been freely divided. The immediate cause of death was broncho-pneumonic inflammation. Separation of the epiglottis is also generally fatal; if the detachment is partial, the flap may become entangled in the glottis; if complete, death will be likely to happen from inanition or inflammation. Larrey and others have mentioned cases in which the epiglottis was shot completely away, and yet the patients made a good recovery.

A wound of the thyroid cartilage penetrating the larynx, is generally a serious accident, as it may be complicated with copious hemorrhage into the windpipe, or be followed by violent inflammation. The danger of such a lesion will be particularly great if, as sometimes happens, the opening extends into the vocal cords, as œdema of the glottis will then be almost sure to arise, and occasion fatal suffocation.

Wounds of the neck sometimes implicate the arytenoid cartilages, as in the interesting case recorded by Sir Charles Bell. A man, who had cut his throat, suffered from repeated attacks of frightful dyspnœa, accompanied with a peculiar flapping sound in the top of the windpipe, for which no rational explanation could be offered. He finally died in a fit of suffocation, when it was ascertained that one of the arytenoid cartilages had been divided, the fragment hanging by a piece of mucous membrane, so as to vibrate in the chink of the glottis, like a pea in a cat-call.

Gunshot wounds of the windpipe are generally mortal, although occasionally recovery takes place under circumstances apparently of the most desperate character. There is reason to believe that this tube possesses the faculty of deflecting bullets. Thus, in a case which I attended in 1858, with Dr. Hooper, a man was struck by a pistol ball directly over the middle line of the neck, about two inches above the sternum, and yet there was no symptom whatever denotive of perforation of the trachea, or of serious lesion of any kind.

The *treatment* of wounds of the windpipe should be conducted by suture, and position, aided by a strict surveillance over the lungs. I am aware that surgeons generally are averse to the use of the suture in lesions of this tube, but I cannot myself see any reason for sharing their fears in regard to its alleged injurious effects. It is the abuse, and not the proper use, of the remedy that produces harm. In regard to injuries of the larynx and trachea, the operation is always perfectly safe, provided the surgeon does not effect approximation until all danger of internal bleeding has ceased. For this purpose he should wait from three to six hours, by which time all oozing will generally have stopped. Then with a fine needle and thread the edges of the wound should be carefully tacked together, by passing the instrument simply through the fibrous covering of the trachea, without, of course, including any portion of its rings. The stitches should be about three lines apart, and one end of the ligature should be cut off close to the knot. The external wound should afterwards be closed by sutures and adhesive strips. If any muscles are divided, their ends should be tacked together with the needle and thread. If the larynx is the part involved, the sutures are carried through the perichondrium, or even through the edges of the cartilages themselves. When the epiglottis is nearly severed, the best plan will be to cut off the flap, lest, falling into the glottis, it should cause suffocation. The dressing is completed by placing the head in an easy, comfortable position, with a slight inclination forwards, and confining it there by means of a tightly-fitting head-bandage, the extremities of which are secured to a broad roller encircling the upper part of the chest. Great care must be taken that the head is not drawn too far forwards, otherwise there may be danger of overlapping of the edges of the wound, both in the windpipe and in the soft parts.

The advantages of the suture in wounds of the windpipe are, first, a more rapid cure, and, consequently, less danger of hemorrhage and inflammation; secondly, greater facility of administering food and drink; and, lastly, much less risk of stricture and fistule of the tube. Should emphysema or internal bleeding occur after the parts have been approximated, it would be easy to open the wound, to a small extent in front, both in the integuments and in the windpipe, and even to introduce a canula, until all danger from these causes has subsided.

The *after-treatment* is strictly antiphlogistic. The tongue is frequently moistened with iced water; food and drink are, if necessary, conveyed into the stomach by means of a suitable tube, passed through the mouth; and the bowels are moved by enemata. Cough is allayed, and sleep induced, by morphia. The head and shoulders are elevated, and the dressings are disturbed as little as possible, the sutures being retained as long as they may seem to do good. Pulmonic and bronchial involvement are met by the usual means. The temperature of the patient's apartment is regulated by the thermometer, and constantly kept at 80° of Fahrenheit. The admission of cold air, especially through the wound, cannot fail to be pernicious, from its tendency to awaken cough and inflammation of the respiratory organs. The patient must be watched with the greatest possible care. If he is suicidally inclined, he must be put in the strait jacket, otherwise he will be sure to tear away the dressings, and open the wound, if he do not inflict other mischief.

Danger may arise during the treatment of laryngeal wounds, from the formation of exuberant granulations, which, extending into the interior of the tube, may so encroach upon it as to cause excessive dyspnœa, if not fatal obstruction. The proper remedy is the removal of the redundant material with the scissors, and afterwards effectually cauterizing the raw surfaces with nitrate of silver. If this treatment fail, recourse must be had to tracheotomy, the wound being kept open until thorough clearance is effected.

Laceration of the windpipe is occasionally met with, generally as the result of a blow, kick, or fall upon the neck, without any external wound, and is always a dangerous accident, imperilling life by paralysis of the air-passages, spasm of the glottis, or suffocation from emphysema. In a case observed by Dr. John L. Atlee, the patient, a boy, aged four years, perished from the latter cause in less than fifteen minutes after the receipt of the injury, produced by striking his neck forcibly against a door-scraper. The air, under such circumstances, escapes from the wounded parts into the cellular tissue of the cervical region, from which it spreads more or less rapidly over the head, trunk, and even the upper extremities, followed by frightful dyspnœa, and, if succor is not promptly afforded, by death.

These injuries may affect both the larynx and the trachea, the former apparently more frequently than the latter. Laceration of the trachea alone may be caused by a sudden and violent effort at inspiration after the integrity of the tube has been impaired by atrophy and ulceration, as in an instance reported to me by Dr. Thomas Marshall, of Kentucky.

The proper remedy in these injuries is obviously tracheotomy, performed without a moment's delay, especially if there is a rapid escape of air into the surrounding structures. In fact, in case of extreme urgency, the operation should be attempted even if the patient is in the act of dying, or has actually ceased to breathe. The wound should be kept open with a suitable tube, the head maintained in a fixed position, and every effort made to allay spasm and prevent the occurrence of severe inflammation. The skin must be freely punctured, if there is extensive emphysema.

Contusion of the windpipe, especially of the larynx, is sometimes followed by very unpleasant symptoms. Such an accident, in fact, may prove suddenly fatal from closure of the rima of the glottis, in consequence of spasm of the laryngeal muscles. The exciting cause is generally a blow or fall upon the neck; and the proper remedy, in case of urgency, is laryngotomy, performed without a moment's delay, a tube being retained in the wound until thorough relief is obtained. When the symptoms are less severe, our chief reliance should be upon antiphlogistics, as leeches, blisters, purgatives, and tartar emetic in union with morphia. If the patient remains aphonious for a long time, recourse should be had to mercury, in alterative and frequently-repeated doses, with stimulating embrocations to the neck.

Wounds of the *œsophagus* and *fauces* should be treated upon the same general principles as wounds of the intestines; that is, by sutures, placed from two to three lines apart, the needle being carried close down to the mucous membrane, and the ends of the ligature, drawn very tightly, cut off close to the knot, the thread eventually finding its way into the interior of the tube. The patient is supported by the stomach tube, introduced several times a day, and also, if necessary, by nutritive enemata.

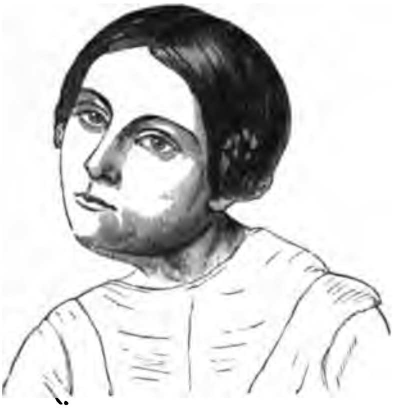
Wounds of the *cervical nerves* are always objects of deep interest. Division of the phrenic nerves is necessarily instantaneously mortal, and the same is true of division of the pneumogastric nerves, although this has occasionally been denied. If only one of the pneumogastric nerves is severed, the patient may survive, as in a case which occurred to Dr. J. H. B. McClellan, or he may finally perish from the effects of congestion and inflammation of the lungs.

Wounds of the neck are sometimes followed by *paralysis* of the superior extremity, from violence inflicted upon the axillary plexus of nerves. In 1858, a young man was at the clinic of the Jefferson College, who had been struck in the neck with a long, narrow knife, the blade entering a little to the left of the median line, and passing behind the trachea and œsophagus, both of which, as well as the large cervical vessels, escaped injury. The right superior extremity became immediately palsied, succeeded by a sense of numbness in the thumb and first two fingers, rendering it thus highly probable that the weapon had wounded the median nerve, either close to its origin, or at the axillary plexus. The muscles soon began to waste, and when I saw the case, about six weeks after the accident, the whole limb was excessively atrophied, purple, and icy cold. The deltoid was very tender on pressure, and severe pain extended along the arm as far as the ends of the fingers, which hardly admitted of the slightest motion. The general health had suffered a great deal, the countenance was very pallid, and there was great disorder of the digestive organs, with loss of sleep. Such lesions, unfortunately, are generally hopelessly irremediable. In the case here described, I was induced, as the man was poor, and endured great pain, to advise amputation at the shoulder-joint, if, in the course of a few months, there should not be marked amelioration.

SECT. II.—WRYNECK OR TORTICOLLIS.

Wryneck, the torticollis of the older surgeons, consists in a permanent structural shortening of some of the cervical muscles, especially the sterno-cleido-mastoid, twisting the head over to the corresponding side, while the chin projects proportionately in the opposite direction, as seen in fig. 280, from one of my clinical cases. The distortion thus produced is characteristic, causing a disagreeable, sinister, and constrained appearance, which nothing else can imitate. When existing in a high degree, the ear is approximated to the upper extremity of the sternum, the clavicle is elevated and deformed in consequence of the excessive tension of the sterno-cleido-mastoid muscle, and the chin is thrown far beyond the middle line, almost into a horizontal position. The expression of the features is remarkably altered; the face on the affected side having a withered, atrophied appearance, the corner of the mouth being depressed, and the eye being much lower than the opposite one. The head is nearly immovably fixed, so that, if the patient wishes to look at any object, he is obliged, unless it is directly in front of him, to turn his whole body; and there is generally, in the more aggravated cases, a peculiar lateral curvature of the neck, the concavity of which presents towards the side of the contracted muscles.

Fig. 280.



Wryneck.

Wryneck occurs in both sexes, but my experience has afforded a larger number of cases in females than in males, and there is no doubt that the affection is generally considerably more frequent in the former than in the latter. The lesion, which is most common in children from three to ten years of age, sometimes begins soon after birth. It has been said to be occasionally congenital, and cases of this description are no doubt now and then met with, but they must be extremely rare, none having ever fallen under my observation. The affection recognizes several distinct causes, of which the principal are inflammation, disease of the cervical vertebræ, and paralysis of the muscles. It may also be induced simply by a vicious position of the head, in consequence of the existence of an enlarged and painful condition of the lymphatic ganglions of the neck, compelling the patient to keep the cervical muscles in a constrained and rigid state. Any circumstance, in fact, that has a tendency to destroy the equilibrium of these muscles, and to place them in an antagonistic condition towards each other, may produce the distortion at any period of life, particularly in children during the rapid development of the body.

However induced, the affected muscles soon become permanently contracted and greatly indurated, as is rendered evident both to the touch and the knife. They feel like dense, rigid cords, which hold the head firmly in its unnatural position, and whose outline is easily traced along the neck. They are diminished not only in length, but also in breadth and thickness; their fibres, in cases of long standing, are converted into pale, fibrous filaments, united by unyielding cellular tissue, and hence, when an attempt is made to divide them, they offer an extraordinary degree of resistance, almost creaking under the knife. These circumstances, taken in connection, afford indisputable evidence that, whatever the exciting cause of wryneck may be, the muscles concerned in its production become the seat of inflammation and plastic effusion, probably at an early period after they have lost their equilibrium, unfitting them for the resumption of their functions without the division of their fibres.

The number of muscles affected in wryneck varies in different cases. Although the sterno-cleido-mastoid always suffers more than any other, yet it is by no means the only one which is concerned in producing and maintaining the distortion. The platysma, trapezius, scalene, splenius, and even the elevator of the scapula, not unfrequently participate in the disorder. It has been found that the sternal portion of the mastoid always suffers first, but I have never seen a case of confirmed wryneck where the clavicular division was not also implicated, generally in a very marked degree.

The *prognosis* of wryneck depends upon circumstances. In the more simple forms of the affection, caused solely by muscular contraction, a cure may generally be certainly calculated upon, especially when the case is comparatively recent. If, on the other hand, the deformity is of a complicated character, as when it is associated with organic disease of the spine, serious lesion of the nervous system, or a crippled state of a large number of muscles, the patient may consider himself fortunate if he obtains any relief at all.

In the *treatment* of this affection, the first indication is to ascertain, if possible, the nature of the exciting cause, and then to regulate ourselves accordingly. If it depend upon rheumatism, the diagnosis may usually be easily determined by observing that this disease exists at the same time in other parts of the body, and that the muscles of the neck are extremely painful and intolerant of motion and manipulation; more or less fever will probably be present, and the features will exhibit a wan and contracted appearance, expressive of the local and constitutional distress. If the case is seen early in the attack, bleeding by leeches will prove beneficial; the bowels should be well moved; and the system should be promptly brought under the influence of calomel and opium, followed by colchicum. Anodyne embrocations, and the application of steam, directed to the part by means of a tube, will be the most suitable local remedies.

A careful examination will generally be sufficient to detect the presence of organic disease of the cervical vertebræ. The most important signs are, the existence of the strumous diathesis, unnatural projection of the spine, and the impossibility experienced by the patient in performing the most simple movements of the neck. The proper treatment will be the prone position, maintained for months together, and a course of alterants and tonics, with a caustic issue at the seat of the disease.

Paralysis of the sterno-cleido-mastoid muscle has been more frequently accused as a source of wryneck than it probably deserves. Very few of the cases that have fallen under my observation could be traced to such an origin. The affection usually begins insidiously, and may depend upon various causes, especially disorder of the digestive organs and of the cerebro-spinal axis. It may affect both muscles, but, in general, it is limited to one, and then the other, continuing the exercise of its functions, contracts upon itself, and is eventually converted into a dense, rigid cord, in obedience to a law that a muscle, deprived of antagonism, is gradually reduced to a kind of fibrous mass, much below the volume of the original. The diagnosis is easily established by a careful examination, which will disclose the great differences in the state of the two muscles, the excessive distortion of the features, and the atrophied condition of the face on the side corresponding with the contraction.

The treatment must be directed to the removal of the exciting cause; when this cannot be detected, the case must be managed upon general principles. Gentle purgation, a judicious regulation of the diet, and strict attention to the secretions, will always be beneficial, and must, therefore, not be neglected. Chalybeate tonics, the cold shower-bath, followed by dry friction with the flesh brush, and exercise in the open air, will be required for the weak and anemic. Shampooing and electricity have been highly lauded in this form of wryneck, but their value has been greatly overrated.

When the affection has reached its confirmed stage, the only remedy is the division of the contracted muscle, and it is well to know that nothing is to be gained in such a case by delay or by a resort to extending apparatus, however ingeniously constructed, or diligently and perseveringly applied. Such a hope is perfectly futile. The subcutaneous operation possesses great advantages over the direct section practised in former times, which always exposed the patient to severe suffering and to protracted suppuration, besides generally eventuating in an imperfect cure. The modern procedure is entirely free from all such contingencies. The only objection that can be at all alleged against it is the difficulty of its execution, but this, I am satisfied, has been greatly exaggerated, for there is no educated surgeon who need be afraid of undertaking it, provided he recalls to mind, at the time, his knowledge of the anatomy of the parts. None but the merest bungler could possibly injure the carotid artery or the internal jugular vein; and as to the external jugular, which lies just behind the sterno-cleido-mastoid muscle, no serious harm could result from its subcutaneous division, as the bleeding could easily be controlled by pressure.

In performing the operation, which should be done while the patient is under the effects of chloroform, the head, inclined slightly forwards, should be held as firmly as possible by an assistant, while another has charge of the extremities. The left finger is then insinuated behind the sternal portion of the muscle, just above its origin, when a delicate tenotome, fig. 281, such as that used in the operation for club-foot, is inserted flatwise behind the muscle at its outer edge, and thence carried on in close contact with its posterior surface, until its point meets the finger on the opposite side. The cutting edge being now turned forwards, the muscle is carefully divided from behind forwards by a kind of sawing motion, from nine to twelve lines above the sternum. The sudden retraction of the belly of the muscle, sometimes with a distinct noise, will denote the completion of the operation. If the clavicular portion be now found to be tense and resisting, the knife should next be passed beneath it, and its division effected in the same cautious manner. Bands of the cervical aponeurosis occasionally project, and may be severed with a narrow, blunt-pointed bistoury, having only about a line of cutting edge near its extremity. If the border of the trapezius is at fault, it may now be divided, and so also any other muscle, provided its proximity to the great cervical vessels and nerves does not absolutely forbid interference.

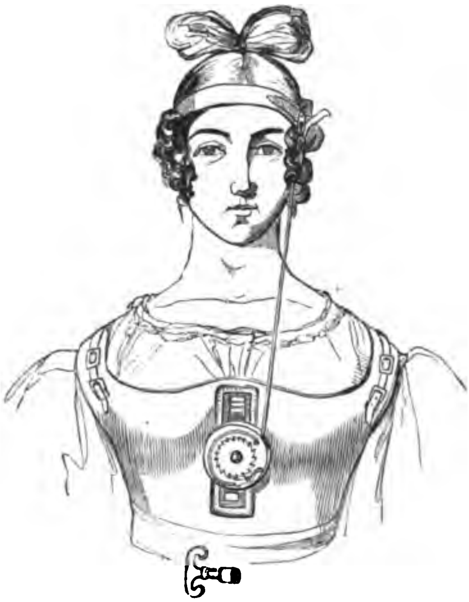
Fig. 281.

Tenotome.

The above procedure is the one which I have always adopted, and in no instance has it been attended by any casualty. The fact is, it is a very simple operation, and one entirely free from danger.

The puncture made with the tenotome is closed with a bit of adhesive plaster, and the patient is placed in bed with his head in a relaxed and

Fig. 282.



Jörg's apparatus for torticollis.

easy position. Light diet is enjoined, and a mild purgative may be given the morning after the operation. As soon as he is able to get up, which will usually be in four or five days, the head should be supported with a suitable apparatus, so constructed as to produce gradual extension of the affected side of the neck. Various contrivances of this kind may be obtained of any of the more respectable cutlers, all of them possessing more or less merit, and well calculated, if judiciously applied, to effect a cure, though not without protracted perseverance.

The annexed drawing, fig. 282, exhibits the apparatus of Jörg, one of the best of the kind yet devised. It consists of a leather corset for the chest, and a firm band for the head, connected by a steel rod, which is moved by a ratchet-wheel, turned by a key, the whole arrangement being such as to permit the head to be moved to one side or the other at pleasure. The cure is promoted by daily frictions with stimulating liniments. Sometimes I dispense with the use of apparatus altogether.

SECT. III.—PARALYSIS OF THE CERVICAL MUSCLES.

Under this denomination may be described a very singular affection of the muscles of the neck, consisting in an irregular spasmodic contraction of their fibres, attended with a helpless condition of the head. The true pathology of the disease seems to be palsy of some of the cervical muscles, which disqualifies them for supporting the superincumbent weight. In some of its features it closely resembles chorea, but it differs from this complaint in being of more limited extent, and unaccompanied by any disorder of the mental faculties. In some instances the affected muscles undergo a species of atrophy, similar to what occurs in wasting palsy. All the cases—probably about a dozen—that I have seen of it occurred in persons after the age of thirty, and of these the majority were females of a nervous, hysterical temperament. It occasionally begins at an early period of life.

The affection generally commences without any assignable cause, and gradually progresses, from bad to worse, until at length the patient is often unable to support his head, or to exercise any control whatever over its movements. In nearly all the cases that I have seen, it was subject to temporary aggravation, apparently consequent upon disorder of the digestive apparatus, irregularity of the menses, or derangement of the nervous system, especially the presence of spinal irritation. Sometimes the muscles are quiescent for days together, when, perhaps all of a sudden, they begin to twitch and jerk until the patient is nearly exhausted with fatigue. Most commonly the head is drawn to one side, evidently by the inordinate action of the sterno-cleido-mastoid, which is thrown into a tense cord that no force can relax. At other times it is thrust powerfully backwards, the neck forming an arched appearance, very much as in opisthotonos. When the affection is fully established, the patient is obliged to support his head almost incessantly with his hand. One of my patients is in the habit of controlling the spasms with the index finger gently pressed against the chin or side of the jaw. It is seldom that the head is inclined directly forwards against the sternum.

The general health is usually materially impaired; the digestive powers are weakened, the bowels are constipated, and the patient is easily fatigued on taking exercise. The extremities are nearly always cold. Great difficulty is sometimes experienced in mastication and deglutition. The mind preserves its natural vigor. Disorder of the menstrual function is often present. Occasionally the affection coexists with similar suffering in other parts of the body.

The diagnosis is readily determined by the history of the case, and by the peculiar character of the spasm. In most of the cases that I have seen, the muscles of the neck, both superficial and deep, seemed to be involved nearly in an equal degree.

The prognosis is unfavorable. Temporary relief may generally be afforded, but I have never met with a case of permanent cure.

The *treatment* must be mainly by tonics, alterants, and purgatives. The secretions must be well looked after. In the female, benefit may be expected from the use of emmenagogues, valerian, assafœtida, and iron with bark. Electricity, medicated frictions, the cold shower-bath, hypodermic injections of morphia or belladonna, and exercise in the open air often afford temporary relief. Subcutaneous division of the contracted muscles is sometimes advantageous, but seldom to the extent that might be anticipated by one who has no experience in the treatment of this disease. I have performed tenotomy most extensively in some of these cases, with no ulterior advantage in any, except one, and in that the relief was marked and permanent. When the affection is irremediable, the sufferer will be benefited by artificial support, such as may readily be supplied by any ingenious cutler.

SECT. IV.—DISEASES OF THE THYROID GLAND.

The thyroid gland is subject to various diseases, of which abscess, serous cysts, and hypertrophy are the most frequent and important. The heterologous formations rarely affect this organ.

1. *Abscess.*—Abscess of the thyroid gland is very uncommon; it is attended by the usual symptoms, and may, when neglected, acquire a large bulk, hanging down the neck like a big pouch. In its earlier stages, it is not always easy, or even possible, to form a correct idea of the nature of the disease; but when the quantity of matter is considerable, its presence will be indicated by a sense of fluctuation, by pain and difficulty of breathing, and by a swollen, discolored, and œdematous state of the integuments. These symptoms, joined with the history of the case, and the concomitant febrile excitement, are quite sufficient, in every instance, to establish the diagnosis. The matter, bound down by the cervical fascia and muscles, is often long in reaching the surface, to say nothing of its tendency to extend down the neck, and its escape should, therefore, always be encouraged by an early incision in the lower part of the swelling.

Such an abscess is sometimes of a latent character. Many years ago, I attended, along with Dr. Charles Woodward, a man aged forty-four, who died of pneumonia, after an illness of three weeks. On inspection, I found the whole of the thyroid gland, with the exception of a small portion of its inferior extremity, converted into a thin, delicate sac, containing nearly ten ounces of thick, yellowish pus, free from odor. The thyroid cartilage was completely denuded, and the matter had burrowed upwards, underneath the hyoid bone, on the left side, as far as the root of the tongue. No symptoms whatever, indicative of disease of the thyroid gland, had existed during life. The abscess was evidently of a strumous character.

2. *Cystic Tumors.*—This organ is, at times, the seat of serous cysts, similar to those of the liver, brain, ovaries, and other structures. Varying in number, in different cases, from one to several dozens, they are situated either directly in front of the neck, or at one side of the middle line, and are found of all sizes,

from that of a cherry-stone to that of an egg. They are composed of thin, elastic coats, and are occupied by a watery, yellowish, or oily-looking fluid, coagulable by heat, alcohol, and acids, thus showing its albuminous constitution. The development of these tumors is, in general, very tardy; they are free from pain and discoloration of the integuments, and they communicate to the finger a soft, elastic sensation, which readily distinguishes them from solid tumors in the same situation. The disease is rarely met with under the age of twenty-five or thirty.

The *treatment* is similar to that of hydrocele, and may be conducted by incision, injection, or seton, the latter of which is usually the most certain and efficient. When there are several such tumors, the best plan is to treat them with the tent, retained until there is a sufficient amount of inflammation to protect the cavity against re-accumulation. Excision may be necessary when the coats of the cyst have undergone the fibrous, cartilaginous, or osseous degeneration.

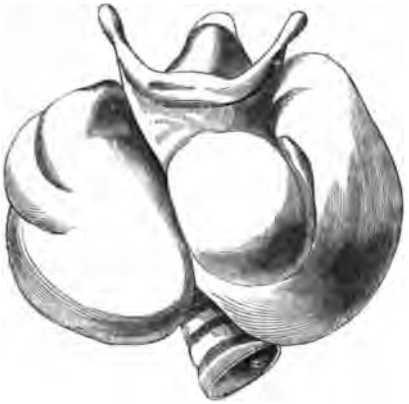
3. *Goitre or Bronchocele.*—Goitre, technically termed bronchocele, is a chronic enlargement of the thyroid gland. The affection, which is much more common in women than in men, and in children than in adults, not unfrequently exists as an endemic, especially in the valleys of the Alps, Apennines, and Pyrenees. In this country, it is often observed in the mountainous regions of Vermont, New Hampshire, Connecticut, New York, Virginia, and Pennsylvania. In our southern States it is uncommon. It has occasionally been noticed among our aborigines, but not to any extent. I have never seen an instance of it in the negro. In England, it is very common in Derbyshire, Norfolk, and Surrey. In the valleys and gorges of the Alps, it is frequently associated with cretinism. The afflicted being has a short, stunted body, shrivelled limbs, a large, unseemly head, a vacant countenance, and a depraved intellect. In fact, in many cases, he is idiotic.

The *cause* of bronchocele is evidently closely connected with the locality in which the disease occurs. Low and moist situations are most obnoxious to it, while high and airy regions are comparatively exempt. Confined, ill-ventilated places, affected with frequent inundations, are remarkably favorable to its production. It is probable that the habitual use of water, strongly impregnated with calcareous matter, is a powerful predisposing cause. There is a form of the disease which apparently depends upon anemia; it is most common in young females, and is usually associated with chlorosis, protrusion of the eyes, and great irregularity in the heart's action. Goitre seldom makes its appearance, even in countries where it is indigenous, before the tenth or twelfth year. Occasionally it is hereditary, and it not unfrequently occurs in several members of the same family. It has been observed in the horse, cow, sheep, dog, and other inferior animals.

The *tumor* varies in size, from the slightest increase of the natural volume of the gland, to that of a fist, a cocoa-nut, or an adult head. When of the latter dimensions, it may reach as high up as the ears, backwards as high as the trapezius muscle, and downwards over the sternum, forming a most disgusting and shocking mass. Both lobes are usually affected, though seldom in an equal degree. Sometimes the disease is confined exclusively to the isthmus, or to this part and to one of the lateral lobes. The swelling increases very slowly, and often remains stationary for years together. Its surface may be smooth and uniform, or rough and lobulated. A very common accompaniment is an enlargement of the subcutaneous veins. No pain attends goitre, except what results from its pressure on the neighboring structures; the skin is free from discoloration, and the general health is unimpaired. When the tumor is of unusual bulk, there may be difficulty of breathing, headache, vertigo, noise in the ears, and an altered state of the voice, which often becomes hoarse and croaking. In such cases the trachea is more or less flattened, elliptical, or even triangular, from the pressure of the superincumbent mass. The external characters of goitre are well exhibited in fig. 283, from a preparation in the Mütter collection.

The internal *structure* of the tumor is liable to considerable variety, depending upon its age and progress. When of moderate standing, it is generally of

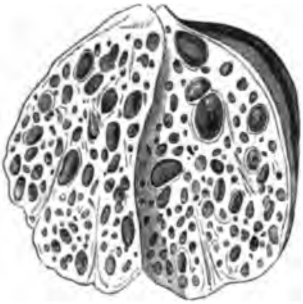
Fig. 283.



Goitre or bronchocele.

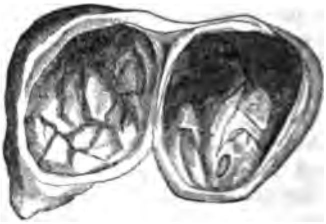
a soft, gelatinous consistence, emitting, on pressure, a ropy, glutinous fluid. In more ancient cases it is of a pale cinnamon tint, hard to the feel, and interspersed with numerous cysts, generally not larger than a pea, containing a serous, glairy, or melicerous substance, and occasionally pus, fibrin, or even pure blood. These cysts are merely enlarged cells, which are dispersed through the organ in the natural state. Fig. 284, taken from one of my specimens, exhibits these cavities hypertrophied from disease, and occupied by a white, semi-concrete substance, similar to plastic matter. Calcareous concretions are sometimes found, either alone or in union with cartilaginous and osseous productions. In a small goitrous tumor now in my private collection, obtained from a man fifty years of age, there are several small steatomatous masses, with a circular nodule of bone, about six lines in diameter. It is of a yellowish color, very compact in texture, and surrounded by a thin, imperfect capsule. Occasionally the whole organ is transformed into an osseous cyst, filled with various kinds of matter, especially the jelly-like, suety, and meliceric. I have a specimen of this kind in my cabinet; one of the lobes has almost entirely disappeared, whilst the other, fig. 285, is converted into a firm, solid capsule, as hard as bone, though scarcely a line in thickness. On sawing through this osseous tumor, which does not exceed the volume of a hen's egg, I found it filled with a white, curdy, friable substance, not unlike semi-concrete cheese.

Fig. 284.



Cystic degeneration of the thyroid gland.

Fig. 285.



Ossified thyroid gland.

The *diagnosis* of goitre is usually sufficiently easy. Its early appearance, its tardy progress, its situation in front of the neck, its indolent character, and its ascent with the larynx and trachea in deglutition, leave little room for doubt in any case. The diseases with which it may be confounded are aneurism of the carotid artery, varix of the internal jugular vein, encysted tumors, and swelling of the lymphatic ganglions.

When goitre is extensive, and occupies the side of the neck, a part of it will necessarily project over the carotid artery, and thus receive its pulsation. In this manner the disease might easily enough be mistaken for *aneurism*. The signs of distinction are, the slow and indolent nature of the swelling, the absence of bellows-sound, and the facility with which the morbid mass may, in most instances, be pressed away from the cervical vessels, when the head is bent forwards so as to relax the muscles of the neck.

An instance now and then occurs in which the whole tumor is the seat of a *violent pulsation* imparted to it by the action of the carotid and enlarged thyroid arteries, in consequence of an anemic state of the system. The nature of the lesion is readily detected by the appearance of the patient and by the history of the case.

Varix of the internal jugular vein is uncommon. The enlargement is seated low down in the neck, just above the sternum, and forms a tumor of an oblong shape, about the size of an egg, soft, elastic, and compressible. It is of a bluish color, has a tremulous, pulsatory motion, and is diminished, or temporarily effaced, by pressure upon the distal portion of the vessel.

An *encysted tumor*, situated directly over the thyroid gland, may simulate goitre. Seldom exceeding the volume of a walnut, it is free from pain, partially translucent, soft, elastic, and obedient to the motions of the windpipe. When the diagnosis is at all equivocal, recourse is had to the exploring needle.

A scrofulous *lymphatic ganglion*, occupying the site of the thyroid gland, may prove to be a source of error. The history, however, of its origin and progress, the hardness of the swelling and its tendency to suppurate, the presence of the strumous diathesis, and the existence of similar enlargements in the neighboring parts, will always be sufficient to enable the surgeon to distinguish between the two affections.

The *treatment* of goitre is generally conducted too much upon empirical principles. Hence, failure is too commonly the rule; success the exception. At the present day, reliance is mainly placed upon iodine and its various combinations, aided by the use of leeches, blisters and purgatives. It must be obvious that no remedies, however valuable in themselves, or however judiciously and faithfully employed, can avail in every instance. When the tumor is of long standing, when it has attained a large bulk, and, above all, when it has undergone some of the transformations previously adverted to, no mode of treatment whatever will be likely to make the slightest impression upon it. Such cases are literally hopeless. It is only in the milder forms of the disease, and in its earlier stages, that any decided benefit is to be looked for. My own plan has been, for many years, to subject the patient to a sort of preliminary treatment, consisting of light diet, and gentle, but steady, purgation. When plethora is present, a full bleeding may be advantageously premised. After the lapse of ten or twelve days, the use of iodine may be commenced, either in substance, or in the form of Lugol's solution. The tincture I rarely employ, as it is apt to prove irritating. In whatever form iodine is administered, it is best always to combine with it a small quantity of opium or hyoscyamus; the dose should be graduated according to the age and susceptibility of the patient, and the effects of the remedy should be carefully watched. After it has been taken for a fortnight or three weeks, its use should be suspended for several days, when it may be resumed and continued as before. In some instances, the protiodide of mercury will exercise a beneficial influence, especially if carried to the extent of slight ptyalism. This article is particularly serviceable in recent cases, in which the swelling mainly depends upon interstitial deposits. The bowels are in no instance to be neglected. Much purging, however, is neither necessary nor proper. The diet should be vegetable and farinaceous. Change of residence is frequently indispensable, especially when the individual lives in a country where the disease is endemic.

The topical treatment consists of the inunction of iodine, leeching, and blistering. The detraction of blood from the affected part is almost always beneficial, from its tendency to unload the capillary vessels, and to rouse the absorbents. From ten to a dozen leeches may be applied every six to eight days, directly over the swelling, and the bleeding encouraged by fomentations. In some instances a rapid reduction of the tumor is effected under the use of blisters, repeated once a week. But I have found no local remedies so efficacious as a combination of equal parts of iodine and camphorated mercurial ointments, rubbed thoroughly upon the tumor twice a day. A piece of oil silk is worn next the skin, and over this, in cold weather, a piece of flannel, for the double purpose of preventing the unguent from soiling the dress and keeping the neck sufficiently warm. In India, where goitre is extremely common, the ointment of biniode of mercury has been found the most reliable remedy. In whatever form iodine is applied, care should be taken that it is not so strong as to fret and irritate the skin, otherwise inflammation, and not absorption, will be the result.

The *seton*, first recommended by Celsus, and again, in 1824, by Dr. Quadri, of Naples, has been frequently used in the treatment of goitre, and occasionally patients have been thus cured. The only case, however, to which it is at all applicable, is where the tumor contains one or more large cysts, which, being traversed by the foreign substance, may be thereby obliterated. The insertion of the seton has sometimes been followed by copious hemorrhage; and in several instances the patient has perished from the violence of the resulting inflammation. At present the practice is nearly obsolete.

Starvation of the tumor, by tying the thyroid arteries, has been practised, but without any encouraging results. The operation was first executed by Mr. Blizzard, of London, and since then it has been practised by Walther, of Germany, Dr. Jameson, of Baltimore, and several other surgeons. In some of these cases no inconvenience ensued, and the bronchocele, in a short time, became considerably reduced in size; in others, no visible effect of any kind was produced; while in a third class the patient either died of hemorrhage or of inflammation. Whether the diminution of volume was permanent, in any instance, we have no means of determining. The probability, however, is that it was not; for such is the amount of blood which the tumor receives, and so great the number of anastomosing vessels, that its proper circulation would, no doubt, be speedily re-established.

For the pulsating form of bronchocele, depending upon an anemic condition of the system, the most appropriate remedies are quinine and iodide of iron, along with a tonic regimen, and the ordinary external applications.

When the tumor resists our curative efforts, and endangers suffocation, it has been proposed to afford relief by *extirpation*. But the question arises, is such a procedure proper or justifiable? In a word, can a thyroid gland, when in a state of enlargement, be removed with a reasonable hope of saving the patient? Experience emphatically answers no. This conclusion is not at all invalidated by the fact that the operation has, in a few instances, been performed successfully. It only proves that an undertaking may occasionally be accomplished under circumstances apparently the most desperate. What has once been effected may be effected again. But no sensible man will, on slight considerations, attempt to extirpate a goitrous thyroid gland. If a surgeon should be so adventurous, or fool-hardy, as to undertake the enterprise, I shall not envy him his feelings, while engaged in the performance of it, or after he has completed it, should he be so fortunate as to do this. Every step he takes will be environed with difficulty, every stroke of his knife will be followed by a torrent of blood, and lucky will it be for him if his victim live long enough to enable him to finish his horrid butchery. Should the patient survive the immediate effects of the operation, if thus it may be called, death will almost be certain to overtake him from secondary hemorrhage, or from inflammation of the cervical vessels, œsophagus, and respiratory organs. When the tumor is large, the wound is of frightful extent, involving all the most important and delicate structures of the neck, and rendering it altogether improbable, from the constant motion of the windpipe and œsophagus, that much of it will unite by the first intention. Thus, whether we view this operation in relation to the difficulties which must necessarily attend its execution, or with reference to the severity of the subsequent inflammation, it is equally deserving of rebuke and condemnation. No honest and sensible surgeon, it seems to me, would ever engage in it.

Finally, when the case is utterly hopeless, and life is threatened by suffocation, temporary relief may occasionally be afforded by the subcutaneous division of the cervical aponeuroses and muscles, at the seat of the greatest constriction, thereby removing tension and pressure from the respiratory passages.

4. *Malignant Disease.*—I am not aware that colloid has ever been noticed in this gland; occasionally, however, the seat of scirrhus, encephaloid, and melano-

sis. The deposits sometimes exist as a primary affection, but more generally they show themselves in connection with carcinoma in other parts of the body, as the liver, mamma, testis, alimentary canal, uterus, and lymphatic ganglions. In the former case, the malady is most common after the age of forty, and usually exhibits itself in the form of small nodules, dispersed through the substance of the gland, which often retains its integrity in the midst of the heterologous matter. At other times, it is seriously changed in its character, the organ itself being enlarged and deformed. The diagnosis of these affections is generally obscure, and hence they often prove fatal before an opportunity is afforded for ascertaining their real nature. Their presence may usually be suspected when the thyroid gland, in advanced life, is the seat of sharp, lancinating pains, when the affected part steadily augments in size and consistence, when the skin becomes adherent and discolored, and when there is great progressive emaciation, with hectic irritation, a sallow, sickly expression of the countenance, and the existence of malignant deposits in other organs. Encephaloid here, as elsewhere, always proceeds more rapidly than scirrhus; the tumor also acquires a much larger bulk, there is commonly great enlargement of the subcutaneous veins, and the general health is earlier and more severely affected. In melanosis, which is still more rare than scirrhus and encephaloid, the tumor is seated just beneath the skin, and occasionally imparts its peculiar color to it. Nothing is to be expected from medicinal means in these diseases, any more than in similar affections in other parts; and, as to extirpation, I know of no circumstances that would render it advisable.

SECT. V.—TUMORS OF THE NECK.

Various tumors, mostly of an innocent character, are liable to form in front and at the side of the neck, often very embarrassing in their diagnosis and treatment.

1. *Glandular Tumors.*—The most common benign tumors of the neck are the glandular, caused by an enlargement of the lymphatic ganglions so abundantly found in this region. They consist essentially of a hypertrophic condition of these bodies, dependent upon the strumous diathesis, disorder of the general health, exposure to cold, or disease of the gums, teeth, jaws, throat, or windpipe. The enlargement may be limited to a single ganglion, but this is uncommon; in general, it affects a considerable number of these bodies, and cases are met with in which it involes the entire chain stretched along the edges and posterior surface of the sterno-cleido-mastoid muscle. When the enlargement is very great, and implicates both sides of the neck, it occasions the most hideous deformity, giving rise to that peculiar appearance of the neck to which, from its resemblance to the neck of the swine, the term scrofulous is usually applied.

The glandular tumor of the neck is generally tardy in its progress, and, in great measure, if not wholly, free from pain. It is of a firm, dense consistence, with a slight degree of elasticity, and is usually remarkable for its irregular lobulated surface, the individual ganglions of which it is composed being either closely grouped together, or separated by distinct intervals. When the disease upon which the hypertrophy depends is extensive, it commonly involves most of the deep as well as the superficial ganglions, extending, perhaps, on the one hand, from the parotid gland down to the collar bone, or even beneath it, and, on the other, from the margin of the trapezius muscle behind to the larynx and trachea in front. In this way the tumor may include in its substance not only most of the muscles of the neck but also the great vessels and nerves, in one confused and inextricable mass.

When the tumor is of long standing the component ganglions are generally completely altered in their structure, being of a dense, firm consistence, and of a whitish, drab, or pale straw color; their capsules are thickened and indurated, and the intervening areolar tissue is either of a fibroid character, or thoroughly infiltrated with plastic matter.

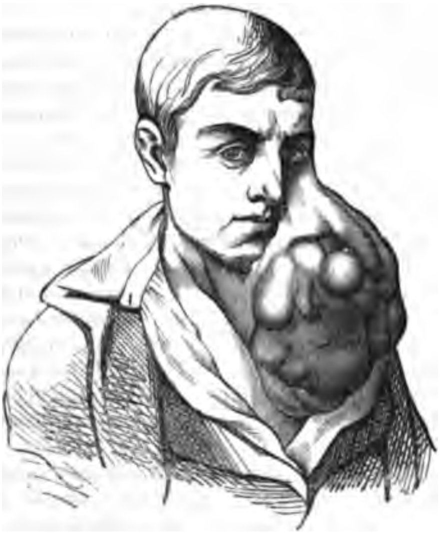
The *diagnosis* of this disease is to be deduced, first, from the history of the case, especially the nature of the exciting cause and the existence of the strumous diathesis; secondly, the tardy progress of the enlargement; and, thirdly, the tuberculated character of the morbid growth, the mass feeling as if it were composed of numerous bodies, more or less closely adherent to each other. The only malady with which it is liable to be confounded is encephaloid, but from this it may generally be readily distinguished by the facts just mentioned, by the absence of the scrofulous dyscrasia, and by the slower march of the enlargement. Moreover, in encephaloid the tumor is usually more circumscribed than in ordinary glandular hypertrophy. Another valuable diagnostic is that, in the latter affection, some of the lymphatic ganglions not unfrequently take on suppurative action, which is not the case in encephaloid.

In the *treatment* of this form of tumor the surgeon must be governed very much by the nature of the exciting cause, the condition of the general health, and the progress and duration of the disease. The milder cases often promptly yield to the influence of antiphlogistics and sorbefacients, aided, when there is evidence of the tubercular dyscrasia, by the different preparations of iodine, barium, mercury, and cod-liver oil. When the disease is very obstinate or intractable, the knife may be necessary, but it is well to know that operative interference here is generally fraught with danger, and that loss of life will almost be inevitable when the tumor involves the deep-seated structures of the neck, the most frequent sources of death being shock, hemorrhage, erysipelas, and pyemia.

2. *Synovial Tumors.*—An encysted tumor sometimes forms in the upper and forepart of the neck, taking its rise in the synovial sac, situated between the hyoid bone and the notch of the thyroid cartilage. This sac, which, in its natural state, is hardly a few lines in diameter, may, in consequence of inflammation, acquire the volume of an egg, if not of a small orange. It is of an oblong shape, elastic, slightly translucent, and filled with a thin, serous, oily, or viscid fluid. The superincumbent skin is healthy, and the swelling is entirely free from pain. The diagnosis is determined, if need be, by the exploring needle. The treatment is by seton, injection, or incision, as in encysted tumors in other parts of the body.

3. *Sebaceous Tumors.*—Occasionally, a sebaceous tumor forms in the thyrohyoid region, where it may be productive of serious deformity and other annoyance. The most remarkable example of the kind I have ever seen came under my observation in 1841, in a lady twenty-eight years old. The tumor had made its appearance at an early age, and had attained the size of a large orange, without causing any pain or discoloration of the skin. Slightly movable from side to side, it extended upwards nearly as far as the chin, while below it overlapped the thyroid and cricoid cartilages. The operation was not difficult, and the patient made a speedy recovery. No vessels required to be tied. The tumor was occupied by a tough, putty-like substance, and had evidently originated in a sebaceous follicle. The most remarkable feature in the history of this case was the great diversity of sentiment that had been expressed concerning its diagnosis.

Fig. 286.



Fibrous tumor of the neck.

4. *Fibrous Tumors.*—A fibrous tumor now and then forms in front of the neck, and may, in time, acquire an enormous bulk, seriously interfering with the patient's looks and comfort. The annexed drawing, fig. 286, exhibits a growth of this description, removed

by me from a youth of seventeen. It had been in progress for several years, and, although free from pain, was productive of great inconvenience. After removal, it was found to weigh upwards of five pounds, and to present a beautiful specimen of the fibrous structure. The tumor was situated superficially, but much care was, nevertheless, required in its removal on account of the great enlargement of the subcutaneous and other veins.

5. *Fatty Tumors.*—Fatty tumors of the neck are very uncommon. They are distinguished by their tardy growth, their mobility, their doughy, inelastic consistence, and their freedom from pain, joined to the integrity of the general health, and the absence of discoloration of the skin. Adults and elderly subjects are most liable to them. They seldom attain much bulk. Care should be taken not to confound them with chronic abscesses. When the diagnosis is doubtful, the exploring needle must be employed. The proper course is extirpation, and this may generally be effected by enucleation.

6. *Serous and Bloody Tumors.*—An encysted tumor, occupied by serum, blood, or sanguinolent matter, occasionally forms in front of the neck, between the sternum and the thyroid gland, taking its rise apparently in the cellular substance between the sterno-hyoid and sterno-thyroid muscles. Its progress is chronic, and it seldom acquires a volume larger than that of a small orange, which it also generally resembles in shape. It fluctuates distinctly under pressure, is free from pain, and readily obeys the movements of the larynx during efforts at deglutition, rising as the tube ascends, and falling as it descends; circumstances which, together with its tardy development, the absence of enlargement of the subcutaneous veins, and the impaired condition of the general health, are always diagnostic of the nature of the affection. The encysted tumor, according to my observation, is almost exclusively met with in young and middle-aged females. Cases occur in which it is congenital.

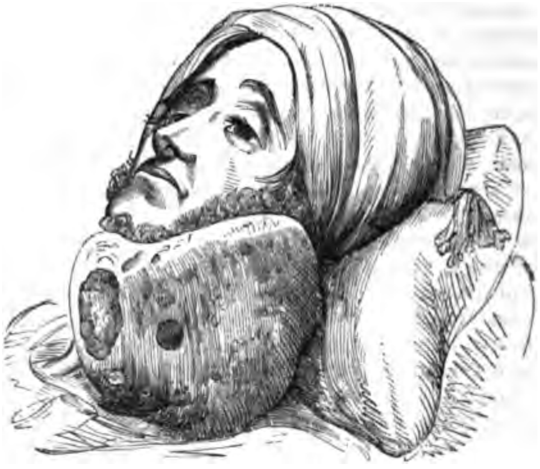
The proper remedy for this morbid growth is excision, which, with proper care, may always be performed with perfect safety. The knife should be used in such a manner as not to penetrate the cyst, since, if this happen, the operation will be one of great difficulty, whereas, under opposite circumstances, removal may generally be effected by enucleation. Very little hemorrhage attends the procedure, and the recovery is usually rapid. I have seen a number of cases where this tumor was greatly diminished by the long-continued application of iodine, but I have never known the treatment to be followed by a permanent cure.

A very extraordinary case of encysted tumor of the neck and chest, of enormous size, was published in the North American Medico-Chirurgical Review, for March, 1860, by Dr. O. B. Knode, of Missouri. Occupying the anterior cervical region, it extended outwards on each side nearly to the shoulder, and down some distance below the ensiform cartilage, being eighteen inches in length, and more than two feet in circumference. It fluctuated distinctly on pressure, and contained a gallon and three pints of inodorous and insipid fluid, of the color and consistence of weak coffee. When the fluid had been withdrawn, a hard, nodulated mass, as large as a double fist, was found with strong attachments to the hyoid bone, thyroid cartilage, and sterno-cleido-mastoid muscle. Immediately after the operation, the parts were firmly strapped with adhesive plaster, and the patient put under the use of iodide of potassium, in doses of five grains thrice a day. At the end of a fortnight the fluid had re-accumulated to the extent of two quarts. It was now again evacuated, and the part strapped as before. In less than a week all discharge had ceased, the solid mass gradually diminished in size, and the man eventually completely recovered.

7. *Malignant Tumors.*—Malignant tumors of the neck, encephaloid in character, occasionally occur, generally commencing in the lymphatic ganglions, and capable of attaining an enormous bulk, as seen in fig. 287. They are nodulated in appearance, rather diffused than circumscribed in shape, soft at some points and hard at others, and accompanied by marked enlargement of the subcutaneous veins. Their growth is usually rapid, and this fact, together with the history of the case, is always sufficient to distinguish them from benign formations. In the latter stages of the disease, the countenance assumes the yellowish, sallow

aspect, so common in carcinoma elsewhere, and the general health rapidly declines, life being worn out by the excessive pain and constitutional irritation.

Fig. 287.



Encephaloid tumor of the neck.

Operations upon the Neck.—The operations necessary for the removal of tumors of the neck are often of the most difficult, perplexing, and bloody character. This is true alike of those of a benign and of a malignant structure, especially when they are large or deep-seated, involving important vessels and nerves, and forming strong attachments, not only to the muscles and aponeuroses, but also to the bones, especially the cervical vertebræ. In the superior part of the neck they frequently extend high up into the parotid region, where they dip in between the ear and the lower jaw, sending processes about in every direction, some of which occasionally reach as far as the mucous membrane of the pharynx. On the other hand, a tumor of the face not unfrequently passes down into the neck, forming thus firm and intimate connections with the parts in this situation. In the inferior cervical region, a growth of this kind often extends beneath the clavicle, and sometimes even beneath the scapula. Fibrous and glandular formations are very prone to take this course, and the consequence is that they are generally extirpated with great difficulty, a long and elaborate dissection being necessary to effect their liberation. Occasionally the morbid mass is so completely buried among the muscles, vessels, and nerves, as to render their isolation a matter of absolute impossibility.

Unless the surgeon is well acquainted with the nature and habits of these growths, and also with the anatomy of the cervical region, he will find himself bewildered at every step of his progress, and be, probably, at length compelled to leave his task partially unfinished. When the growth is seated along the base of the jaw the incision should, as a general rule, be curvilinear, in close proximity to the bone, as this will be the least likely to be followed by a disfiguring scar. Sometimes a crucial, T or V shaped incision is necessary. A similar proceeding is usually required in operating upon the inferior part of the cervical region. In front of the neck, the incision should usually be oblique, in the line of the sterno-cleido-mastoid muscle, and this course should generally be pursued whether the growth lies on the inside or on the outside of this muscle. In many cases the tumor will be found to be so thoroughly tied down by it as to require its division early in the operation. The deeper attachments should always, if possible, be severed with the finger, or with the handle of the scalpel. If the point of the instrument is used for this purpose, great, if not irreparable, mischief may be caused. Sometimes the surgeon is reluctantly compelled to leave a portion of the morbid growth, owing to the extraordinary depth to which it passes or to the nature of its attachments. In such an event, a ligature should be cast firmly around it before the main mass is liberated.

All arteries should, as a general rule, be tied as soon as they are divided, and the large veins should be dealt with in a similar manner. Any veins that may be imbedded in the morbid growth should be included in two ligatures, and divided in the interval. Unless these precautions are observed there will be great risk of the entrance of air, not to say anything of hemorrhage, which would often be very copious, if not positively fatal. So far as my observation goes, it is never necessary, in any of the operations upon this region, to ligate, as a preliminary step, the common carotid artery.

Great care must be taken not to wound any important nerves, as the phrenic or pneumogastric. Experience has shown that no harm results from the division of the spinal accessory and cervical nerves, properly so called, or of the descending branch of the ninth pair.

In summing up the general characters of the operations upon the neck, for the removal of morbid growths, the great points to be considered are, first, the difficulty of their execution, and, secondly, their liability to be attended with profuse hemorrhage, injury to important nerves, and the entrance of air into the veins. The after-treatment should always be conducted with special reference to the avoidance of erysipelas, pyemia, and diffuse inflammation. Despite, however, the closest and most skilful attention, the patient will not unfrequently perish.

SECT. VI.—ABSCESS OF THE NECK.

There is no region of the body in which abscesses are so frequent as in the neck, or so difficult of diagnosis and treatment. Liable to occur at all periods of life, and under all conceivable circumstances, they may be common or specific, acute or chronic, superficial or deep, large or small, bold or stealthy in their origin and progress. Their favorite seat is the upper and lateral part of the neck.

Among the more common causes of cervical abscesses are, exposure to cold or the sudden suppression of the cutaneous perspiration, disease of the teeth, gums, and lower jaw, and the exhausting and poisonous effects of measles, scarlatina, and typhoid fever. Scrofulous persons are particularly liable to their formation from the most trivial circumstances. A bad form of abscess of the neck occasionally arises from disease of the tongue, hyoid bone, larynx, trachea, fauces, and œsophagus.

However induced, cervical abscesses are commonly ushered in by more or less general disorder, attended with severe pain, swelling, and induration. When situated superficially, the skin becomes early discolored, assuming a purplish and congested appearance, and distinct fluctuation is soon perceptible. When, on the contrary, the matter is deep seated, the skin may for a long time retain its normal aspect, and fluctuation may either be entirely absent, or else show itself only as the fluid approaches the surface. Severe, tensive throbbing pain usually attends the more aggravated forms of the complaint, the movements of the neck are greatly impeded, the patient swallows with difficulty, and even the respiration may be seriously embarrassed, simply from the extension of the inflammation or from the pressure of the accumulating fluid.

Owing to the remarkable laxity of the cellular substance of the neck, and the great firmness of its aponeuroses, the tendency of these abscesses is to burrow extensively among the muscles, the pus often passing down below the clavicle and around the great vessels, windpipe, pharynx, and œsophagus. Such an event is particularly prone to occur in weakly, scrofulous children, the subjects of scarlatina, measles, smallpox, and typhoid fever, and also in old, broken-down anemic persons, in whom the morbid action frequently spreads with extraordinary rapidity, the tissues readily yielding to its devastating influence. In general, the matter is finally evacuated through the skin, but cases are occasionally met with in which it bursts into the anterior mediastinum, the fauces, œsophagus, windpipe, the carotid artery, or even the internal jugular vein.

The *treatment* of these abscesses must be conducted upon general principles, due regard being had to their nature and to the condition of the system, which is often greatly disordered, and therefore requires to be amended. A course of tonics and alterants will frequently prove highly efficacious. The best local remedies are leeches, blisters, iodine, cataplasms, and saturnine lotions. Matter should be evacuated early, by suitable incisions, made in such a manner as not to interfere with any important vessels, or to leave any disfiguring scars. When the healing process is sluggish, a healthful stimulus may be imparted to the sore by the application of nitrate of silver, or injections of iodine, sulphate of copper, or acid nitrate of mercury.

The *synovial burse* in front of the neck, or the structures immediately over it, may become the seat of an abscess. It may have an independent origin, or it may be caused by reflected irritation from the throat, windpipe, or lungs. The symptoms may be so obscure that the disease may elude detection during life. In general, however, there is more or less tumefaction of the affected part, difficulty of swallowing, spasmodic cough, and a sense of strangulation. An early incision is required, to prevent the abscess from bursting into the windpipe.

SEC. VII.—AFFECTIONS OF THE HYOID BONE.

The hyoid bone, from its peculiar situation and relations, is liable to various diseases, some of which originate in its own structure, while others are communicated to it from the surrounding parts. These affections have been described with great care by Dr. Gibb, in his monograph on the Diseases of the Throat and Windpipe, and are deserving of special attention. Fractures and dislocations of the hyoid bone are treated of in the first volume. I shall here limit myself to a few brief remarks on inflammation, necrosis, and several other pathological changes.

Inflammation of the hyoid bone may arise from external injury, or from the effects of syphilitic and other diseases. It generally begins in the fibrous covering of the bone, and occasions more or less swelling of the neck, severe pain, dysphagia, and difficulty of respiration. By and by, matter forms, and, if it is not speedily evacuated, it may cause extensive havoc among the surrounding structures, attended by an increase of all the local phenomena here alluded to. The treatment must be strictly antiphlogistic, with leeches, iodine and blisters to the neck, and an early and free incision, to afford vent to pent-up fluids.

When *necrosis* occurs it may be limited to a particular portion of this bone, as to one of its horns, or it may affect one half or even its entire substance, as in a case recorded by Rozart. The patient, a lady, aged thirty-six, was of a scrofulous habit, and had been ill for five years, when she coughed up the dead bone, and immediately recovered. A similar case has been described by Sprey. The disease is frequently associated with ulceration of the larynx and throat. As soon as the bone is sufficiently isolated, it should be removed with the knife and forceps.

The hyoid bone is sometimes eburnized, or converted into a hard ivory-like substance; and Warren alludes to an instance in which the right horn was the seat of an exostosis, of a conical form, and about three inches in length. In elderly subjects the thyro-hyoid articulations are sometimes completely anchylosed.

A *cyst*, filled with sero-oleaginous fluid, sometimes springs from the body of this bone, and may, in time, acquire a considerable bulk. Dr. Gibb has described one, contained in the museum of the College of Surgeons at London, which was of an ovoidal shape, and upwards of two inches in diameter. It sprang from the hollow at the posterior part of the body of the hyoid bone, was loosely connected to the surrounding parts, and was occupied by a thick grumous fluid, full of cholesterine.

Wounds of this bone are uncommon. They are generally the result of gunshot injury, or of violence inflicted in attempts at suicide, and are to be treated upon the same principles as similar lesions of the larynx and trachea.

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CHAPTER XI.

INJURIES AND DISEASES OF THE CHEST.

SECT. I.—WOUNDS OF THE CHEST AND LUNGS.

WOUNDS of the chest, like those of the abdomen, necessarily divide themselves into external and internal, or those which affect the wall of the chest, and those which implicate its contents. They may, as in other parts of the body, be of various kinds, as incised, lacerated, punctured, or gunshot, and they may be either simple or complicated, according to the nature and amount of tissue involved in the injury.

External wounds of the chest, unless accompanied by severe concussion, profuse hemorrhage, or fracture of the ribs, are rarely attended with any particular danger, and require no other treatment than that which regulates the conduct of the practitioner in the management of wounds in general. When the lesion is considerable, it may be necessary, especially if the patient is harassed with cough, to adopt means for securing the quietude of the chest by the application of a broad bandage and the occasional exhibition of an anodyne draught; but under ordinary circumstances both these expedients may be dispensed with. Any foreign substance, as a splinter of wood, a ball, or a loose piece of bone, must, of course, be removed, either on the instant, or as soon as its situation is rendered obvious. The direction which a ball sometimes pursues upon striking the chest, especially if it comes in contact with the sternum, spine, or ribs, is very remarkable. Thus, instead of lodging at or near the point of entrance, it has been known to make almost the entire circuit of the thorax, passing underneath the integuments, and becoming arrested a short distance from the point of ingress, or, perhaps, issuing even at the same orifice, as has occasionally happened in military engagements. When this is the case, the course of the projectile is generally indicated by a reddish or purplish line, which will be more distinct in proportion to the size of the ball; and, in addition to this, there is not unfrequently a crackling sensation imparted to the finger as it sweeps over the chest in pursuit of the intruder, caused by the presence of air. In some instances the ball lodges between two ribs, perhaps splintering them, and finally effecting an entrance into their substance.

When two openings exist in the chest the probability is that the ball has escaped, and yet it is possible that a portion of it may have been cut off, and retained. The orifice of entrance may usually be readily distinguished by the fact that, if a bone has been struck, the fragments will be forced inwards towards the lungs, whereas they will be pushed outwards at the orifice of egress. When the missile comes in contact with a costal cartilage, it simply breaks it, without carrying any of its substance into the chest. Sometimes a bullet perforates the lungs, and lodges under the skin, opposite its point of entrance. When this is the case, the air may escape from the thoracic cavity into the subcutaneous cellular tissue, and be thus more or less extensively diffused over the body.

External wounds of the chest are seldom attended with much hemorrhage; it is only when an intercostal artery is laid open that there will be likely to be much bleeding, and in that event the proper procedure will, of course, be the ligation of the vessel. The operation, however, is generally difficult, if not impossible, owing to the deep situation of the vessel. When this is the case, I should not hesitate to drill a small aperture into the rib, just above the artery, and to pass a silver wire round its bleeding orifice. Such a procedure, although apparently harsh and unscientific, would not, I suppose, involve any special risk from inflammation of the pleura. Lesion of the internal mammary artery is occasionally followed by hemorrhage into the anterior mediastinum. If it is so copious as to compress the heart and lungs, or to cause great exhaustion, the proper plan will be to expose and ligate the vessel at all hazard.

Wounds involving fracture of the ribs or sternum must be treated upon the same general principles as fracture of these bones without such lesion of the soft parts, that is, the movements of the thorax must be controlled with the bandage, and cough and pain allayed by anodynes and appropriate antiphlogistic measures.

The lungs are sometimes seriously, if, indeed, not fatally injured without any apparent lesion of the walls of the chest. A young man, while riding, fell from his horse on his left arm. He complained of no pain, but in twelve hours he was seized with alarming hemoptysis, and died in a few days. The dissection revealed an extensive laceration of the posterior part of the right lung, and a copious effusion of blood into the pleural sac, without any external sign of violence. A similar accident has occasionally been produced by a fall from a scaffolding; and Dr. Edward Hartshorne, a few years ago, met with an instance in which a man's lungs were fatally ruptured by the passage of the wheel of a cart, although there was no outward mark of injury. The occurrence of such a lesion is easily explained by supposing that the lungs, at the moment of the accident, are forcibly distended with air, so that the walls of the chest, on being brought violently in contact with them, readily cause their rupture.

A ball striking the chest, without leaving any other mark upon the skin than perhaps a slight weal, not unfrequently produces violent effects; primarily severe, if not fatal shock, with more or less hemoptysis, and, secondarily, intense inflammation of the lung, or lung and pleura, followed, occasionally, by profuse empyema and an attempt on the part of the pent-up fluid to escape externally, its progress being sometimes denoted by the existence of air under the integuments.

Internal wounds of the chest are much more serious accidents than external; they are generally made by balls and sharp-pointed instruments, as knives, dirks, lances, sabres and bayonets, and are often attended with severe lesion of the contents of the thoracic cavity, terminating life either on the spot, or at a period more or less remote from the occurrence of the injury. Hence their effects may conveniently be arranged under two heads, the primary and secondary; the former including shock, collapse of the lung, hemorrhage, and pneumothorax; the latter, inflammation and its consequences, as accumulations of serum, lymph, and pus in the pleural cavity.

Internal wounds of the thorax may be further divided into those which merely pierce its walls, without inflicting any injury upon its contents, and those in which the contents participate in the mischief.

Death from mere *shock* is by no means uncommon in wounds and injuries of the chest; cases of the kind are frequently met with both in civil and military practice, and their occurrence has occasionally been noticed where, upon dissection, no serious lesion has been detected to account for so untoward a result. The treatment of such cases does not involve anything peculiar, as it does not differ from that of shock from other causes. Our principal reliance must necessarily be upon sinapisms and stimulants, especially in the form of enemas, with opium, to calm the nervous system and sustain the heart's action; but great caution should be observed in their use, particularly if there is reason to believe that the depression is dependent, in part, upon intra-thoracic hemorrhage, lest, by the induction of early reaction, the bleeding should be encouraged instead of being repressed.

Collapse of the lung is much less frequent than was formerly supposed, and is not, by any means, a necessary effect of a penetrating wound of the chest. The occurrence will be most likely to happen when the wound is direct and of large size; under opposite circumstances, and especially when the opening presents a valvular arrangement, or when the passage leading from it is long and devious, the air will find it difficult, if not impossible, to enter the chest to such an extent as to counterbalance that in the lung, which will thus, consequently, retain its natural position. Even when the wound is of considerable size the organ is sometimes found to resist collapse, as is proved by the fact both that the respiration is unembarrassed and that the lung is seen moving to and fro beneath the aperture in the thoracic wall. Still more satisfactory proof is occasionally furnished by the protrusion of a portion of the lung across the wound in the chest, thus constituting what has been, curiously enough, called pulmonary hernia, or *pneumonocele.*

Collapse of the lung is always a serious occurrence, as the patient is thus generally instantly deprived of one-half the quantity of air which he was accustomed to breathe before he was injured; if both organs are similarly affected, the difficulty will, of course, be proportionately increased, although even then the case is not necessarily fatal, for both clinical observation and experiments on the inferior animals have shown that the lungs, under these circumstances, so far from collapsing, may become so completely distended with air as to project from the thoracic cavity on each side, and yet the subject make a very rapid and satisfactory recovery. It is not improbable that the state of the patient's strength exerts a considerable influence upon the production of collapse; the accident being more likely to take place when he is exhausted by shock and loss of blood than when he is able to command the free use of his respiratory muscles. In the former case, he is very much in the condition of a person who is partially asphyxiated, and, consequently, incapable of distending his lungs, which are thus easily collapsed by the accidental ingress of the smallest quantity of air; in the latter, on the contrary, his efforts, which are often very violent, enable him effectually to resist the encroachment, and even to force the lungs somewhat out of the chest.

Collapse of the lung is characterized by excessive dyspnœa, the patient struggling violently for breath, and throwing himself about in the greatest distress and anguish; the ribs on the affected side are immovable, the respiratory murmur is completely absent, the voice is weak and indistinct, and percussion elicits an unusually clear resonance. With these symptoms are conjoined those of sudden and severe prostration, as excessive pallor of the countenance, a feeble, almost imperceptible pulse, and clammy sweats, followed by coldness of the extremities.

When the chest is pierced without collapse of the lung, the air generally makes a peculiar noise as it rushes into the pleuritic sac; and, if the opening of communication is sufficiently large, the lung may be seen to move up and down in consonance with the egress and ingress of the atmosphere, filling, perhaps, the whole, or, at any rate, the greater portion, of the thoracic cavity. The voice is not materially changed, if at all, and the vesicular murmur is nearly natural, although the respiration is performed with great labor and difficulty. Soon after the accident there will be an escape of blood at the wound at each effort at inspiration, and, if the pulmonary tissue has been injured, the patient will cough up blood, or, perhaps, have actual hemoptysis, especially if some of the larger vessels have been divided. A discharge of blood by the mouth, however, is not a positive evidence of penetration of the lung, experience having shown that the mere concussion of the chest by a ball or shot is capable of producing it.

The *prognosis* of penetrating wounds of the chest is exceedingly unfavorable. In many of the cases life, as above stated, is destroyed on the instant, or, at all events, shortly after the infliction of the injury, either by shock or hemorrhage, or the two together. When both sides are pierced death may take place from collapse of the lungs, although such an event is much more infrequent than is commonly supposed. Should the patient be so fortunate as to escape from the immediate effects of the lesion, he will stand a fair chance of perishing from inflammation of the lungs and pleura; or, surmounting this, from pyemia or hectic irritation.

Gunshot wounds of the chest are generally much more dangerous than wounds inflicted with the lance, sabre, or bayonet, owing to the fact that they are attended with more laceration, and frequently also with the lodgment of the bullet and other foreign matter. A penetrating wound of the apex of the lung is not so dangerous as one of the root of this organ, as it is less liable to be followed by copious hemorrhage and severe inflammation. In the old mode of warfare more than half of those who were shot through the chest died, but this ratio has been immensely increased since the introduction of the conical ball. The mortality from this cause in the Russian army at the siege of Sebastopol seems to have been most appalling, only 3 out of 200 having recovered. In the British army, on the contrary, during the same campaign, the surgeons saved 27 out of 147. The fatality in this class of injuries is, doubtless, much influenced by the mode of treatment and other attentions received by the wounded. The Russian surgeons in the Crimean war relied, it would seem, chiefly upon the use of digitalis, whereas the British depended mainly upon copious venesection.

The *treatment* of penetrating wounds of the chest requires, in the first place, accurate closure of the orifice of communication, provided there are no contra-indications; and, in the second, the employment of such measures as may tend to prevent the occurrence of severe inflammation of the pleura and lung, which is so liable to happen after all injuries of this kind, even when the latter organ is not directly implicated. The treatment of hemorrhage will be considered under the head of hemothorax.

If any foreign substance is present, it should promptly be removed, provided it is easily accessible; for the rule here, as in all other visceral cavities, is to refrain from officious interference. Nothing, under such circumstances, can more clearly betray the ignorance of the surgeon than the introduction of the probe into the chest; a careful exploration of the outer wound is always admissible, especially when suspicion exists that a rib has been fractured, or that a ball has lodged in one of the intercostal spaces. If a probe is required, the finger, if not too large, will always answer that object better than anything else.

I have met with cases of shot wounds of the chest where the ribs were so much splintered as to require removal with the cutting-pliers; but the instances demanding such a procedure must necessarily be uncommon, and, in general, the duty of the surgeon is limited to the extraction of the loose, or partially detached, fragments. Such cases, it need hardly be added, are extremely apt to prove fatal.

If the lung is collapsed, an attempt may be made to draw the air out of the thoracic cavity with a large syringe, although such a procedure will generally be unnecessary, as the organ will of its own accord soon regain its natural position. If a portion of lung protrude, or puff out through the wound, it should immediately be returned, and proper means taken to prevent a recurrence of the accident. On no account should it be excised, not even if it is gangrenous, as might happen if a number of days have elapsed since the receipt of the injury, or if the patient has been injudiciously treated. Under such circumstances, the separation of the slough should be promoted by mild applications, and when this has been effected any outward tendency on the part of the lung may easily be counteracted by graduated compression during the granulating and cicatrizing processes. I am aware that a number of instances have been reported of excision of portions of the lung thus protruded, but such cases should certainly not be taken as guides of practice, or as examples for our imitation.

When the wound is very large, it should be closed with a suitable compress and adhesive strips, or collodion plaster. Cases occur in which, when the orifice is very capacious, occlusion may be effected by sliding the integuments down over it from the parts in its immediate vicinity. Such a procedure would, of course, be objectionable when there is extensive injury of the bony case of the chest.

Dr. Howard, of the army, recommends a plan of treatment in gunshot wounds of the chest, which he calls "hermetical sealing." It simply consists in cutting away the contused structures down to the ribs, so as to convert the wound into an incised one of an elliptical form, and in effecting close and accurate approximation with silver sutures, deeply inserted, at a distance of a quarter of an inch from each other. The dressing is completed by carefully wiping the surface, and then covering it well with shreds of charpie arranged crosswise, and thoroughly saturated with collodion. The object of the procedure is to exclude the air from the chest, and thereby diminish the chances of suppuration and other untoward occurrences. Its value can only be determined by future observation. Meanwhile, it is positively certain that it is not, as Dr. Howard seems to think. applicable to all gunshot wounds of the thorax.

When a ball, after having perforated the lungs, has lodged under the skin, the best plan is not to disturb it until the wound in the wall of the chest is healed, otherwise it may greatly increase the chances of inflammation. The only exception to this rule is where the injury is complicated with a comminuted fracture of the ribs, sternum, or vertebræ, requiring extraction of large splinters of bone.

Collapse of the lung, partial or complete, is sometimes produced by an accumulation of blood within the chest, occurring immediately after the receipt of the injury. Should this be found to have proceeded from one of the intercostal arteries, the proper remedy will be the ligature, after which the blood may either be removed mechanically, or be permitted to drain off spontaneously, by making the patient lie upon the affected side, so as to render the wound, if possible, the most dependent part of the body. If, on the other hand, it is evident that it has been derived from the lung itself, the best thing that can be done is to let it remain, in the hope that, by compressing the injured structures, it may serve as a hemostatic.

When the lung retains its natural position within the chest, the inflammation consequent upon the injury soon causes it to adhere to the edges of the wound, and, in this manner, all communication between the exterior and the pleuritic cavity is generally speedily cut off; an occurrence which is one of the greatest safeguards that can possibly happen in such a case, and which should always, if practicable, be promoted by making the patient lie upon the affected side. If, on the other hand, the lung is collapsed, it may be so tied down by effused blood and inflammatory deposits as never to regain its original situation.

To avert and moderate inflammation of the lungs and pleuræ in wounds of the chest is one of the great objects of our treatment, as this constitutes the chief source of danger when the patient survives the immediate effects of the injury. The principal agents for accomplishing this are the lancet, tartar emetic and opium, purgatives, cupping, and counter-irritants, especially epispastics. If the system has not been too much drained of blood by the accident, the bleeding should be both early and free, and repeated at short intervals until a decided impression has been made upon the disease; otherwise our chief reliance should be upon the use of tartrate of antimony and potassa, in union with anodynes, to allay pain and cough, and promote sleep. For controlling the circulation liberal use should also be made of veratrum viride, its effects being carefully watched, lest too much cardiac depression should arise. The bowels should be thoroughly moved by senna and sulphate of magnesia, or calomel and jalap; blood should be taken by cups or leeches from the chest, over the seat of the morbid action; and, if these remedies do not prove speedily successful, a large blister should be applied, and retained until complete vesication is produced. Many of these cases, however, either do not bear these depletory measures at all, or only to a very limited extent, and hence not a little judgment is often required to determine when to employ or to reject them. Perhaps our best guide, in such an event, is the state of the pulse and of the countenance; when the former is hard, full, and frequent, and the latter hot and flushed, lowering agents are plainly indicated, whereas, if the reverse is true, they should be refrained from, tonics and stimulants being used in their stead. Sometimes a kind of middle course is the most judicious.

Penetrating wounds of the chest are extremely liable to be followed by serous, sero-sanguinolent, and purulent effusions, no matter what means may be adopted for their prevention. If the accumulation be trifling, it will generally disappear spontaneously, or under the influence of suitable local and constitutional remedies, as in ordinary pleurisy, or pleuro-pneumonia; but when it is abundant, means must be adopted for its removal, otherwise the patient will be extremely apt to perish. I have seen several cases of death simply from neglect of this precaution. The presence of fluid is denoted by the ordinary symptoms of thoracic effusion, of which absence of the respiratory murmur, dulness on percussion, excessive dyspnœa, harassing cough, and inability to lie on the sound side, are the most prominent and characteristic. If the accumulation is very great, there will be, in addition, partial effacement, and, perhaps, even bulging of the intercostal spaces, thus imparting greater certainty to the diagnosis. All doubt, of course, vanishes if the fluid escapes at the external wound. The formation of pus is generally preceded and accompanied by rigors and hectic irritation.

The proper *treatment* of this accident is sufficiently obvious. If the external wound has not yet closed, the body is placed in such a position as to render that the most dependent part, and it is seldom that any other procedure will be necessary. In a case under my charge in 1848, in which the chest had been penetrated by a pistol ball, evacuation of the cavity could only be effected by placing the patient on his knees and elbows, at the same time raising the hips and lowering the head, thus making the orifice as dependent as possible, an operation which was repeated, for several weeks, at least three times in the twenty-four hours. He ultimately made an excellent recovery, with a collapsed lung. Before this expedient was resorted to, the fluid was occasionally drawn off with a syringe. When no opening exists, or when it cannot be made available for the purpose in question, a new one should be made, care being taken to select the most suitable part of the chest for furnishing a ready outlet to the pent-up fluid, and to avoid injury to the intercostal arteries. Patency of the orifice is maintained by a proper tent, or canula, well secured to the side of the chest, lest it should slip into its cavity.

Injuries of the lungs not unfrequently exert a very prejudicial secondary effect upon these organs, eventuating in the production of abscess, or the development of phthisis, the latter being more likely to take place when there is a hereditary tendency to this disease. Such occurrences cannot always be avoided, but the fact that they may happen should be borne in mind by the surgical attendant, as this will be one of the surest means of preventing them.

Although balls and other foreign bodies, lodged in the lungs, occasionally become encysted, yet in the great majority of cases they ultimately produce extensive and fatal disorganization of the pulmonary structures. The time at which this result occurs is very variable. A man, aged thirty-five, shot at the battle of Novi, died at the end of seven years, the bullet being found near the base of the left lung, in a distinct membrane, surrounded by indurated tissue. His health, after he had recovered from the more immediate effects of his wound, remained tolerably good for four years, when he was seized with an increase of dyspnœa, nocturnal cough, and hectic irritation, with pain in the chest, and inability to lie on the right side. He had no other sign of pulmonary disease, but finally died completely exhausted. In a case related by Dr. M. H. Houston. a piece of coarse domestic linen, evidently the patch of a bullet, about two inches and a half in length by two in width, when unrolled, was found in the left lung, twenty-five years after its introduction. The cavity in which it lay was opposite the fifth intercostal space, near the spinal column; it was lined by a smooth, tough membrane, and communicated with several of the bronchial tubes, into one of which the foreign substance projected, thus keeping up the cough and irritation which had so long annoyed the patient. The ball, along with a piece of rib, had been extracted immediately after the receipt of the injury. In the chapter on gunshot wounds, allusion is made to a case where an ounce bullet was found in the right lung, in a distinct cyst, forty-five years after its introduction. In a few fortunate instances, the foreign body has been ejected during a violent paroxysm of coughing, excited by its presence. In a case which I attended in 1848, the ball, on dissection, was found lying loose upon the surface of the diaphragm, on the right side, the patient having survived the effects of his wound nearly one month. The missile had entered the chest between the tenth and eleventh ribs, two inches from the spine, and had perforated the base of the lung, which was completely collapsed.

Penetrating wounds of the thorax occasionally remain *fistulous* for an almost indefinite period. Such an event will almost certainly arise when the pulmonary and costal pleuræ fail to adhere for some distance around the more dependent parts of the external orifice, thereby forming a kind of pouch, in which the matter, furnished by the sac, is allowed to accumulate instead of passing off as fast as it is poured out. The manner in which the pouch is usually emptied is by the patient placing himself in a particular posture favorable to the escape of its contents; but as this is often irksome and inadequate, it is seldom that the case receives the requisite attention, and hence many years often elapse before a cure is finally effected. The proper remedy is a counter-opening, made at the most dependent portion of the sac, so as to admit of a ready drain, both during recumbency and in the erect posture, the puncture being prevented from closing by a tent or canula. In a case that was under my care, some years ago, I pierced the chest through the fifth intercostal space, directly over the pericardium, and soon succeeded in effecting obliteration of the adventitious cavity. The patient was a young man who had inflicted a penetrating wound between the second and third ribs, in front of the chest, with a hatchet, which flew off its handle, while he was engaged in nailing laths. The cure of these affections, which is generally followed by a remarkable retrocession of the wall of the chest, is sometimes promoted by weak astringent and detergent injections, or by injections of a very dilute solution of iodine.

Another unpleasant secondary effect of wounds of the chest is *necrosis* of the ribs and sternum, the exfoliation of which is generally a work of time and suffering, months not unfrequently elapsing before complete riddance can be effected of the disease. The existence of the lesion is usually indicated by a puffy and painful swelling of the part, by a foul discharge, and by the appearance of one or more cloacæ, leading from the surface to the dead bone below. As soon as the bone is found to be loose, it should be removed.

SECT. II.—HEMOTHORAX.

The hemorrhage which succeeds wounds of the chest, constituting what is called hemothorax, may proceed either from the lung, or from some artery in the wall of the thorax, as one of the intercostal, or a branch of the internal mammary; not unfrequently it is derived from both sources. The quantity of blood poured out varies from a few ounces to several quarts, and hence its effects upon the lung and system may either be very slight or exceedingly severe; perhaps, in the latter case, causing death by exhaustion within a few minutes after the accident, or putting life in jeopardy at a more remote period by inflammation and various deposits.

The *symptoms* which characterize intra-thoracic hemorrhage are such as denote loss of blood in other parts of the body, with the superaddition of respiratory embarrassment occasioned by the mechanical compression of the lung. The countenance is deadly pale, the pulse small, quick, and tremulous, the surface cold and clammy, the breathing oppressed, the head giddy, the mind anxious. Thirst and restlessness generally exist in a high degree; the patient experiences a sense of weight in the chest, and is unable to lie on the sound side; the thoracic walls emit a dull sound on percussion; and, if the effusion is large, there will be complete absence of vesicular murmur, with a tendency to flattening of the intercostal spaces. Blood usually escapes at the external wound, and, in the event of injury of the pulmonary tissue, is also discharged by the mouth, either in a pure state, or mixed with frothy mucus. Hemoptysis, however, is not always present in penetrating wounds of the lung. I have seen quite a number of cases where it was entirely wanting.

When blood escapes from the chest into the subcutaneous cellular tissue along the spine, it is apt to gravitate towards the loins, giving rise to an ecchymosic appearance of that region, which some, as Valentin, Larrey, Louis, and others, have been led to regard as pathognomonic of hemothorax, or effusion of blood into the pleural sac. This statement, however, must be received with some allowance; for it has been shown, on the one hand, that this phenomenon is often entirely wanting in hemorrhage of the chest, and, on the other, that it may be present simply as a consequence of a bruise or contusion, when there has been no injury of this cavity.

The manner in which the blood in hemothorax is disposed of is subject to some diversity; when the quantity is small, it is generally absorbed, followed, probably, by some adhesive action of the pleura; if, however, the quantity is large, it will not only violently compress the lung, but, assuming the solid form, be sure to excite severe inflammation, eventuating in serous and other effusions, which thus greatly complicate and aggravate the original difficulty. Instances occur in which, along with the extravasated blood, there is a considerable accumulation of air, thus combining hemothorax with pneumothorax, and, of course, increasing the urgency of the symptoms and the dangers of the case.

It will thus be perceived that the *prognosis* of intra-thoracic hemorrhage is always serious, except in the minor and more unimportant cases. Death may occur within a few minutes after the accident, or the patient may recover from the primary effects, and perish from the secondary, particularly from the mechanical compression of the lung and the irritation which the blood excites by acting as a foreign body.

The *treatment* of this form of hemorrhage is by no means satisfactory, since it is based upon speculation rather than any well-defined principles. The patient should lie on the affected side, and the wound kept open, unless the escape of blood is so excessive as to threaten serious, if not fatal, exhaustion, in which event it must be promptly closed. The head and shoulders should be elevated, iced water applied to the chest, acetate of lead and opium freely given internally, and, if the strength is not too much impaired, blood taken from the arm, to the extent of slight syncope, the operation being repeated as often as there is a decided tendency to overaction and to recurrence of hemorrhage.

When the blood proceeds from the lung, a circumstance, however, which cannot always, or, perhaps, even generally, be ascertained, the most judicious plan, probably, will be to let it remain in the hope that it may exert a favorable hemostatic action upon the wounded part; but as soon as all apprehension is over in regard to a recurrence of the bleeding, as it generally will be in five or six days, the effused fluid should be evacuated by operation, either by enlarging the original wound, or, if this is situated unfavorably, by making a free opening through one of the intercostal spaces at the most dependent portion of the chest, or wherever the results of percussion and auscultation may unite in locating the extravasated substance. The respiratory organs must be incessantly watched, to protect them from harm, the slightest tendency to inflammation being promptly averted with the lancet, tartar emetic, calomel, and opium, along with thorough and early vesication of the chest.

SECT. III.—PNEUMOTHORAX.

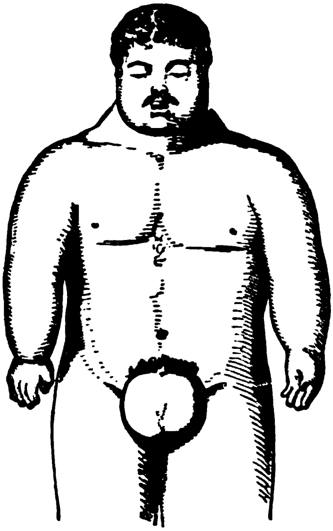
Pneumothorax is caused by injury of the substance of the lung, admitting of an escape of air into the pleural cavity, and, in some cases, also into the posterior mediastinum, and thence, by the cervical vessels and nerves, into the subcutaneous cellular tissue of the neck, trunk, and extremities. But in order that the latter occurrence may happen, it is necessary that there should not only be a wound of the lung, but likewise of the costal pleura. When these two conditions coexist, it is easy to perceive how the air in the pulmonary vesicles may, during the expansion of the lung, be forced into the areolar structure beneath the lining membrane of the thoracic cavity, and thus constitute what is denominated emphysema. Collections of air in these situations may be caused by injury inflicted upon the lung through the walls of the chest, especially if the wound is very small, oblique, or valvular, thereby interfering with the outward escape of the fluid; or they may form independently of any external wound, in consequence of the laceration of the pulmonary tissues by a piece of broken rib, or the sudden and violent compression of the lung during a fall of the body from a considerable height, although such an event must be extremely rare.

Emphysema of the cellular tissue of the trunk occasionally occurs without pneumothorax, as when a portion of lung that has become firmly adherent to the wall of the chest has been injured by the end of a broken rib being driven into its substance. In such a case, which is also one of extreme infrequency, the air may readily escape from the wounded organ into the areolar structure beneath the costal pleura, and from thence into that of the trunk and extremities, but cannot obtain access to the thoracic cavity.

The symptoms denotive of pneumothorax are generally of a very decisive nature. Percussion of the chest affords a remarkably resonant, or hollow, drum-like sound, wholly dissimilar from that which is elicited in any other disease, and, therefore, of itself characteristic of the presence of air; the vesicular murmur is either much diminished, or entirely absent; the breathing is considerably embarrassed; the voice is feeble; difficulty is experienced in lying on the affected side; and the respiration in the sound lung is puerile.

The symptoms of emphysema are also distinctly marked. The puffy, colorless, and elastic swelling, crackling under pressure, and commencing at a particular part of the chest, either at the wound, or, if there is none, opposite a broken rib, and gradually spreading in different directions, is an unmistakable sign of the existence of air beneath the integuments. The air, in consequence of the permeable nature of the structure in which it is lodged, may readily be pushed from one place to another, especially soon after it begins to make its appearance; and occasionally travels with astonishing rapidity over the greater portion of the body, destroying all distinction of the chest, neck, and face, and thus inducing the most unseemly and frightful deformity, as seen in fig. 288.

Fig. 288.



General emphysema of the whole surface, after wound of the right side of the chest.

The *treatment* of pneumothorax and emphysema is very simple. In general, the air in the pleural cavity will be rapidly decomposed and absorbed; should it prove troublesome, by causing serious respiratory difficulty, it may be let out slowly by means of a delicate trocar, introduced so as to make a valve-like aperture, which should be closed immediately after with adhesive strips, supported by a compress and bandage. Emphysema is usually easily controlled by compression; but if it should threaten to become very extensive and inconvenient, or if it actually be so when advice is demanded, the most prompt and effectual remedy will be a moderately free incision at the seat of injury, or a number of little punctures in different parts of the body.

SECT. IV.—HYDROTHORAX AND PYOTHORAX.

Under these names may be described those collections of serum and of pus which supervene upon acute and chronic pleurisy, whether the result of accident or of disease. Collections of this kind are extremely common, and are of great surgical interest, from the fact that they may generally be removed by a very simple and safe operation.

In acute pleurisy, large quantities of serum are frequently poured out in an astonishingly short time, especially when the disease is of great extent and of unusual violence. The fluid is generally thin, colorless, and intermixed with lymph; sometimes it is of a reddish hue, from the presence of hematin, and occasionally it is found to be remarkably yellowish, and of a thick, viscid consistence, not unlike copal varnish or fresh olive oil.

It is very seldom that genuine pus is poured out in acute pleuritis, yet such cases are sometimes met with, and that, too, at an early period of the disease. I have seen several instances, chiefly in young, plethoric children, in which one of the thoracic cavities was literally filled with purulent fluid in less than a fortnight from the commencement of the disease.

The water in chronic pleuritis is generally much more abundant than in the acute disease, often amounting to a number of quarts, if not to several gallons. It is also more thick and turbid than in acute attacks, being usually of a light lemon color, and of a somewhat oleaginous consistence. Sometimes it is of a greenish or reddish hue, and cases occur in which it contains blood and pus. The fluid, when drawn off, and allowed to stand for some time, generally separates into two parts; one, thin and viscid, like serum, occupying the top; the other, which consists of fragments of lymph and albumen, resting at the bottom. This disunion not unfrequently takes place during the sojourn of the fluid in the cavity of the chest.

Large portions of lymph are often intermixed with this fluid; and instances are met with in which it consists almost entirely of pure pus. When this is the case, the fluid is generally more or less fetid; sometimes, indeed, almost insupportably so. The quantity of pus is occasionally enormous, amounting, perhaps, to several gallons. When the disease is of long standing, the matter may be partly contained in separate cavities among the layers of adventitious membranes which are so liable to form under such circumstances. I have repeatedly met with cases of chronic pleurisy in which three or four such cavities existed; some being filled with pus, some with serum, and some with a mixture of these fluids and of blood. Finally, it is proper to add that old thoracic accumulations occasionally contain gas, and various kinds of concretions, especially the fibrous and fibro-cartilaginous.

The *effects* which these various effusions exert upon the lung are generally very distressing, if not most disastrous, compressing and condensing its substance, so as to render it unfit for the purposes of respiration. When the quantity of fluid is very great, the organ is sometimes reduced to a mere cake-like mass, hardly as large as the hand, lying in the back part of the chest, by the side of the spinal column. In this condition, it is occasionally bound firmly down by bands of lymph, so that, even if the fluid is ultimately gotten rid of, it remains incapable of expansion. Very frequently, also, especially in protracted cases, the pulmonary tissues become thoroughly solidified, in consequence of the mechanical compression to which they are subjected, thus rendering them hopelessly impervious to the air. The pleura, in chronic inflammation, is usually very much thickened from interstitial and surfacial deposits, and closely adherent to the surrounding parts.

The *diagnosis* of these collections is a subject of the deepest interest, and, therefore, deserving of special consideration. It is founded mainly upon three circumstances: first, the history of the case; secondly, the changes in the configuration of the thorax; and, lastly, the alterations in the respiratory functions.

1st. The history of the case will show whether the effusion is the result of traumatic or constitutional causes; if the latter, whether the consequence of ordinary pleurisy, pleuro-pneumonia, or tubercular disease; finally, whether the affection is acute or chronic, open or latent.

2d. Whenever the pleuritic effusion is unusually copious, it sensibly encroaches upon the chest, so as to cause a very manifest enlargement of the corresponding side; the intercostal spaces are not only abnormally widened, but perhaps thrust considerably beyond the level of the ribs. The diaphragm is also more or less depressed, and the heart is thrown out of its natural position, either to one side or down towards the stomach. The extent of the dilatation of the chest varies in different cases, but rarely exceeds two inches. The best way of determining it is to measure both sides with a graduated tape, carried from a central point of the sternum, under the mamma, to the spinous process of the corresponding vertebra. The eye alone, however, is often quite sufficient to detect the difference, even though it be comparatively slight.

When the intercostal spaces are much distended, and there is at the same time great wasting of the tissues, fluctuation may occasionally be detected; but such an occurrence is very uncommon.

3d. The effects exerted by these effusions upon the respiratory sounds and movements are generally of an unmistakable character. The alteration of the vesicular murmur is always in direct ratio to the quantity of fluid, being deep and feeble when it is moderate, but entirely wanting when it is very abundant, except, perhaps, along the spinal column, where it may still be somewhat audible over a space a few inches in extent. When old adhesions exist between the pulmonary and costal pleuræ, as often happens in the upper part of the chest in tubercular disease, the fluid, unable to compress this portion of the lung, may allow it to receive a certain quantity of air after respiration has ceased everywhere else. No friction sound is ever present when there is much fluid in the chest. To produce such an effect, it is necessary not only that the two pleuræ should be roughened with lymph, but that they should rub more or less against each other. Ægophony exists only when the effusion is moderate, or only a few lines in depth; hence, it is not present either in the very early or in the more advanced stages of the disease. Finally, during certain movements of the body, especially if suddenly made, a splashing noise may occasionally be heard within the chest, resembling that produced by agitating a cask partly filled with water.

Dulness on percussion is always present when there is much effusion; commencing at the lower part of the chest, from which it gradually ascends as the fluid mounts upwards, and changing with the position of the patient. This symptom, however, considered by itself, is of no diagnostic value, inasmuch as it always attends solidification of the lungs, in whatever manner induced. When the pleuritic effusion is blended with the extrication of gas, percussion elicits a remarkably clear tympanitic sound.

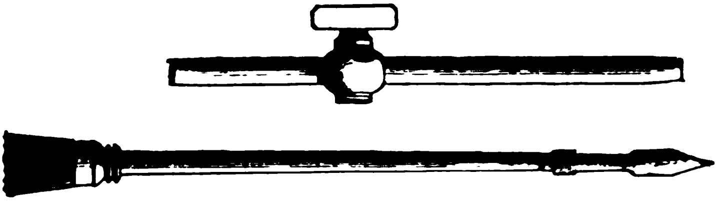
4th. The most important functional symptoms, especially in chronic pleuritic effusions, are hectic fever, rapid emaciation, pain in the chest, troublesome cough, a sense of tightness and oppression, great dyspnœa in ascending a flight of stairs, and inability to observe recumbency. If the patient lies down at all, he lies on the affected side, on his back, or in an intermediate posture.

Collections of water, or of water and pus, in the pleuritic sac, occasionally find their way out to the external surface; generally through one of the intercostal spaces, as in two cases which have been kindly shown to me by Dr. Da Costa. Sometimes the discharge takes place through the bronchial tubes. Le Dran, Andral, and others have recorded instances in which it was evacuated through the diaphragm. When the patient survives such an event, the track is lined by false membrane, and often remains fistulous for a long time.

But a spontaneous opening is a rare occurrence; and hence, as the fluid, when existing in large quantity, cannot be rendered amenable to the absorbents, the only remedy is to evacuate it by operation, otherwise it will inevitably destroy the patient. Paracentesis of the chest, although occasionally performed by some of the older surgeons, was not placed in its true light until within the last fifteen years. In this country, attention was first prominently directed to the subject by Dr. Bowditch, of Boston, in a series of papers which have honorably associated his name with this department of pathology and practice. From the results of his cases and of those of other observers, it is evident that the operation, when properly performed, is not only perfectly safe, but generally eminently successful, the issue being always more favorable, other things being equal, in proportion to the shortness of the time that has elapsed since the commencement of the disease, the excellence of the general health, and the absence of purulent matter. When the patient is much exhausted from protracted suffering and serious organic disease, the chances of recovery will, of course, be much lessened.

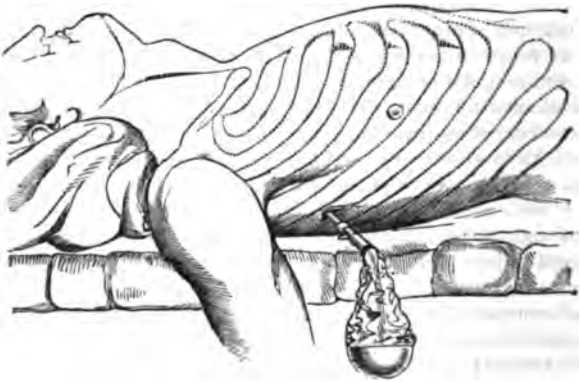
The *operation* of tapping the chest is very simple. The instruments which are required are a scalpel and a long, slender trocar, furnished with a stopcock, fig. 289, to prevent the entrance of air into the serous sac. The patient being comfortably propped up in bed, a small incision is made through the integuments, previously rendered tense, just above the upper margin of one of the ribs, generally the sixth, about midway between the sternum and spine, or just posterior to the digitations of the great serrated muscle. When the fluid points externally, the puncture is made at the most prominent and dependent portion of the swelling. The trocar is then thrust boldly through the intercostal space, penetrating the muscles and pleura, as well as any false membranes that may be adherent to its surface. The trocar being now withdrawn, the fluid will come away in a full stream, a suitable vessel having been provided for its reception. A large gum-elastic bag or beef's bladder, secured by a nozzle to the extremity of the canula, will be found to be the most eligible article for the purpose. When it is filled, the stopcock is shut until the bag can be re-attached, and thus the operation is continued until the cavity is completely emptied. Upon withdrawing the canula, the integuments immediately resume their natural position, and thus effectually occlude the puncture. The edges of the outer wound are approximated by an adhesive strip, which is the only dressing required, the bandage being objectionable on account of its constricting effects. The site of the operation and mode of performing it are well illustrated in fig. 290, from Erichsen.

Fig. 289.



Instrument for tapping the chest.

Fig. 290.



Tapping of the chest.

The operation is generally well borne, especially if the patient is slightly under the influence of chloroform, which also, in great measure, prevents the cough that is otherwise so apt to attend it. If the patient becomes faint, his head should be gradually lowered, and free use made of brandy. The former of these precautions will usually be required anyhow, with a view to complete clearance of the chest. As the fluid flows off, the lung, if not adherent or solidified, steadily expands, and at length regains its natural volume. If the accumulation has been very great, the operation will probably be obliged to be repeated several times before a final cure can be effected. The after-treatment is very simple; opium is given to allay cough and pain, and the system is supported by good diet and milk punch. When the case is very tedious, the fluid manifesting a strong tendency to re-accumulate rapidly after each operation, the cure may be expedited by the cautious injection of some slightly stimulating lotion, or simple tepid water, and the daily application of the dilute tincture of iodine to the walls of the chest.

When a spontaneous opening arises in the chest in empyema, it will generally be found to be altogether inadequate for effectual drainage, both on account of its small size and its vicious site. When this is the case a counter-opening, or a puncture in some more eligible situation, should be made; for it is very desirable, in every instance of the kind, that the matter should have an opportunity of escaping as fast as it is formed. A similar procedure may occasionally be required after the operation of tapping. The use of the drainage-tube has lately been recommended under such circumstances, but the treatment, it seems to me, should not be encouraged, as it is both harsh and dangerous.

Paracentesis of the chest is sometimes attended with injury to the lung, the point of the instrument being thrust into its substance. Such an accident, which, however, is seldom followed by serious consequences, will be most liable to happen when the organ has contracted firm adhesions. The intercostal artery is easily avoided by making the puncture in the lower part of the intercostal space, at a considerable distance from the inferior margin of the upper rib. Much outcry has been made about the risk of the entrance of air during the operation, but I am not aware of any case that has proved fatal, or that has led to any serious detriment from this cause.

The most valuable statistics of thoracic paracentesis are those furnished by Dr. John A. Brady, of Brooklyn, consisting of an analysis of 132 cases. Of these, the operation eventuated in complete recovery in 79; 14 were relieved; and 37 ended fatally; in 1 the result was not known; and in 1 no benefit followed. In quite a number of the patients that died, the disease had committed irremediable ravages before recourse was had to the operation. Of the 37 fatal cases, 11 were carried off by phthisis.

Dr. Bowditch, in a communication with which he kindly favored me in 1858, states that he had, up to that time, tapped 72 persons, making in all 125 punctures; but he made no mention of the relative number of recoveries and deaths. In every case marked relief had followed the operation. The ages of the cases ranged from four years to seventy-six.

Finally, the removal of the fluid from the pleuritic cavity, whether by medicine or operation, is always followed, especially in cases of empyema, by a remarkable contraction of the corresponding side of the chest, which generally remains during life, except when the patient is very young, and the lung regains its full expansion, when it sometimes nearly entirely disappears.

Collections of pus are liable to form in the *anterior mediastinum*, either as a result of external injury, as a blow or fall upon the chest, a fracture of the sternum, or caries or necrosis of this bone. The principal symptoms are, severe pain, great tenderness on pressure, and difficulty of respiration with inability to lie down. Violent rigors sometimes attend. The diagnosis must necessarily be obscure. The matter usually points at an intercostal space by the side of the sternum: occasionally it bursts into the pleuritic cavity.

For the relief of this affection, La Martinière proposed tapping the sternum; but such an operation could only be justifiable when the abscess has been caused by caries, necrosis, or fracture of this bone, and then, of course, there should be no hesitation about its performance. Ordinarily, the surgeon waits until the matter points, when evacuation is effected with the lancet. Trephining of the sternum might be required for the removal of a foreign body in the anterior mediastinum.

SECT. V.—WOUNDS OF THE HEART.

Wounds of the heart may be of an incised, punctured, or gunshot nature, according to the character of the vulnerating body; and their gravity is generally such as to lead very speedily to fatal results. Severe lesions are sometimes inflicted upon this organ without any serious injury of the integuments, or any solution whatever of their continuity, as in fracture of the ribs and sternum, in which some of the fragments are driven into its substance, or so rudely pressed against its surface as to cause more or less contusion.

Wounds of the heart may be limited to the walls of the organ, penetrate its cavities, or affect its partitions. In the first case, they may be said to be superficial; in the other two, deep, and, consequently, of a more serious character. Experience has shown that those parts of the organ which are least protected by the sternum and ribs are those which are most liable to be injured. In 121 cases, analyzed by Dr. A. M. Jamain, the right ventricle suffered in 43, the left in 28; the right auricle in 8, the left auricle in 2; the apex and base of the heart in 7; the interventricular septum in 2; both ventricles in 9, and both auricles in 1. In 61 cases, analyzed by Dr. Ollivier, of Angers, 29 affected the right ventricle, 12 the left, 9 both ventricles, 3 the right auricle, 1 the left auricle, and 7 the apex or base of the heart.

In *gunshot* wounds of the heart, the ball may lodge in the walls of the organ, or in the interventricular septum, as in the interesting case related by Professor Carnochan. At other times, but this, also, is extremely rare, it may penetrate one of the cavities of the heart, and then fall into the inferior cava, descending, perhaps, nearly as far as the bifurcation of that vessel. Of this occurrence, a remarkable example is afforded by the unique case reported by Dr. Simmons, of a young man who received a pistol-shot in his chest, during my residence at Cincinnati, in 1835. He died at the end of ninety-seven hours, without having given any evidence whatever of being wounded in the heart. Upon dissection, however, an opening, pretty firmly closed by blood and plasma, was discovered in the upper part of the right ventricle, the inner surface of which exhibited a lacerated appearance, but no appreciable lesion existed in any other portion of the organ, and it was only by accident that the ball was detected in the inferior cava.

Of 22 cases of accidental *rupture* of the heart, analyzed by Mr. Gamgee, 12 occurred on the right side and 10 on the left; 8 of the former affecting the ventricle, and 4 the auricle, while of the latter 3 involved the ventricle, and 7 the auricle. The pericardium in half of the cases was intact. Such an occurrence can only be explained on the assumption that the ventricle was dilated at the moment of the percussion.

Wounds of the heart are often complicated with other injuries, as fractures of the ribs and sternum, and wounds of the lungs, diaphragm, and large vessels.

In gunshot wounds, the heart is occasionally fatally injured without any apparent lesion of the walls of the chest. At the last siege of Antwerp by the French, a number of cases occurred in which this viscus was severely contused and ruptured, and yet the closest scrutiny failed to detect any external evidence of the mischief. In some of these cases, death happened instantaneously, while in others it was preceded by violent pneumonia, or by a copious effusion of blood into the pleural sac. Professor Holmes, of Montreal, has recorded a curious instance in which the right ventricle of a young man contained a transverse linear opening, large enough to admit the finger, without any wound in the pericardium, leading to the inference that this membrane had been driven before the ball into the heart, while the latter was forcibly distended. The ball was found loose in the cavity of the chest.

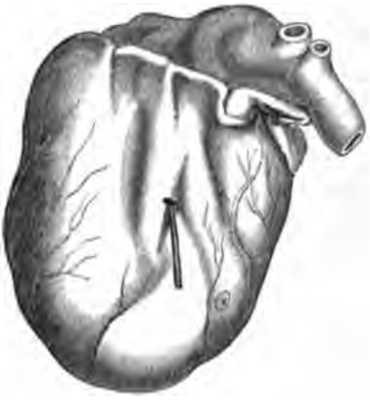
The *symptoms* of wounds of the heart are not always well marked, but often quite the reverse, thus occasioning great doubt as to their diagnostic value. In general, they are such as indicate severe shock, whether from mere nervous depression or from loss of blood, which is often exceedingly profuse. The patient is faint, anxious, and deadly pale; the pulse is small, frequent, and irregular;

the surface is cold and clammy; the pupils are dilated; the voice is feeble and indistinct; and the respiration is laborious, and often interrupted by sighs. The pain is usually very severe, especially in the region of the sternum; and, upon applying the ear to the heart, a peculiar noise is perceived, similar to that which is heard in aneurismal varix, or during the passage of blood from an artery to a vein. Although the patient is usually very much exhausted by the shock consequent upon a wound of this organ, cases not unfrequently occur in which he is able to walk or run a considerable distance before he falls down or expires.

These symptoms are, obviously, not pathognomonic; for they may be caused by various other lesions, as a wound of the lungs or large vessels. Important information may often be derived from a consideration of the situation and direction of the wound. Thus, if a knife, sabre, or ball has entered the chest on the left side, between the fourth and fifth ribs, about two inches from the sternum, and the patient is in the condition above described, there will be strong reason for concluding that the heart has been laid open, especially if the external wound has pierced the pleura. Probing, in such cases, can be of no use in any respect, and should, therefore, be avoided.

The *prognosis* of wounds of the heart is generally, though not invariably, unfavorable. Much will depend, in every case, upon the nature of the injury, especially its extent and direction. Sometimes a single shot is sufficient to cause death almost instantaneously, as happened in the case of a boy, aged seventeen, from whom the accompanying sketch, fig. 291, was taken. He was out gunning with his brother, who, in shooting at a rabbit, about twenty yards off, accidentally hit him in the chest, a stray shot passing through the left ventricle, near its middle. When a ball or knife takes an oblique, tortuous course among the muscular fibres of the heart their contraction may be such as to close the track made by the vulnerating body until a clot is formed, and so oppose, in great measure, the effusion of blood, thereby affording the wound an opportunity of undergoing reparation. However this may be, there are numerous instances upon record which serve to prove that recovery is by no means impossible. Thus, Dr. Randall, of Tennessee, has reported the case of a negro boy, who died sixty-seven days after having been wounded in the chest with a load of shot. The lesion was followed by severe inflammation of the lungs, but there was no indication that the heart had been injured, and the lad was thought to be convalescent, when he suddenly died from over-indulgence in eating. Upon dissection, five shot were found in the heart, three in the base of the ventricle, and two in the bottom of the auricle; the wounds in the walls of the organ were all firmly healed, and the surfaces of its cavities exhibited no trace of former suffering. In the case of a soldier, mentioned by Fournier, a musket ball was discovered in the right ventricle of the heart, in contact with its septum, six years after he had been shot. Dr. Balch found a ball in the lower part of the wall of the right ventricle of a man eighteen years after he had been wounded. He recovered from the immediate effects of the injury in six weeks. In the case of Poole, recorded by Dr. Carnochan, the probability is that recovery would have taken place if the man had been more careful of himself, and had not been otherwise hurt. He died eleven days after the accident; and the dissection showed that the bullet, which was one-third of an inch in diameter, was enveloped in a delicate cyst, as it lay firmly imbedded in the muscular septum, midway between the apex and base of the ventricles, a quarter of an inch beneath the surface. The cause of death was inflammation of the heart and pericardium,

Fig. 291.



Shot wound of the heart.

the latter of which was so enormously distended with sero-sanguinolent fluid as to encroach greatly upon both lungs.

Some remarkable instances have been recorded of persons surviving a considerable length of time after the heart had been transfixed by foreign substances. Thus, Ferrus has narrated the particulars of the case of a man who lived for twenty days with a skewer traversing his heart, and Mr. Davis mentions one of a boy who lived upwards of a month with a piece of wood, three inches long, in the right ventricle.

Of 85 cases of various kinds of wounds of the heart, analyzed by Lantenelet, death occurred instantaneously in 14, in two days in 16, in four days in 9, in eight days in 20, in twelve days in 9, in sixteen days in 5, and in the remaining twelve at a period varying from 17 days to 9 years.

The cause of death in wounds of the heart is hemorrhage or shock, if it occur soon after the accident, and inflammation, if it occur more remotely.

A mere contusion of the heart is occasionally sufficient to destroy life, as in a case mentioned by Nélaton, where the anterior wall of the right ventricle was bruised and slightly lacerated by a pistol ball, death occurring at the end of twenty-four hours. The ball was found in the pericardium, which was filled with bloody serum.

The *treatment* of wounds of the heart must be conducted upon general principles. If the patient is found in a swooning condition, a drink of cold water, with an abundance of cold air, may be allowed, and the head and shoulders should be laid low in order to promote the access of blood to the brain. If the shock is excessive, sinapisms are applied to the spine and extremities, and an injection of turpentine or ammonia given; but all internal stimulants are, if possible, avoided, lest, by favoring untoward reaction, they should increase hemorrhage and the tendency to inflammation. Protracted depression is rather to be desired than avoided. Hence the treatment, for the first two or three days, should be as much as possible of an expectant nature. Opium should be given largely to relieve pain, which is often very severe, but, above all, to tranquillize the wounded organ, the tumultuous action of which cannot fail to exert a most injurious influence upon the reparative process. It should be combined with aconite and acetate of lead, to augment its sedative influence and promote the coagulability of the blood. When inflammation has set up, our chief reliance must be upon the lancet, antimony, calomel, opium, mild purgatives, and revulsives to the chest, especially large blisters, with elevation of the head and shoulders. The patient must take great care of himself during convalescence and for a long time afterwards.

Wounds of the *pericardium*, uncomplicated with lesion of the heart, are occasionally observed, and their occurrence is probably more frequent than is generally supposed. A number of interesting cases of recovery from such injuries have been reported, their former existence having been satisfactorily verified by examination after death, months, if not years, after their infliction.

Wounds of the pericardium necessarily give rise to inflammation, the presence of which cannot always be recognized by the usual signs of that disease, as the friction sound may be entirely absent in consequence of the interposition of a large quantity of blood between the membrane and the heart. When much fluid exists, whether it be pure blood, or serum, the precordial region will necessarily sound dull on percussion, and often become preternaturally prominent, in the same manner as the thorax in pleuritic effusion. The pulsations of the heart are irregular, tumultuous, and obscure, and the patient finds it difficult, if not impossible, to lie on his back without suffering from swooning, and a sense of impending suffocation. In a case which I saw with Dr. Knapp, auscultation for many days together afforded a peculiar lapping sound, similar to that made by a dog in lapping water, as if the heart had been splashing about in a fluid.

The treatment of wounds and ruptures of the pericardium must be conducted upon the same general principles as similar injuries of the heart.

Wounds of the *large vessels* of the chest are sufficiently common, and are, perhaps, still more frequently fatal than those of the heart. Their symptoms and treatment require no special attention here.

A rare case of recovery from a stab in the ascending aorta with a knife has been recorded by Dr. Heil. The patient, a Bavarian soldier, died of pneumonia, upwards of a year after the accident, when the wound, which had penetrated all the coats of the vessel, was found to be closed by a firm cicatrice. Guattani and Pelletan each describe an instance in which a wound of the aorta was followed by a false aneurism, the patient of the former surviving the accident several years, of the latter upwards of two months.

No case, so far as I know, of recovery from wound or rupture of the vena cava has been met with. Blumenbach refers to an instance, observed by Lentin, in which a person lived for many months, although in a very feeble state, after laceration of the thoracic duct.

SECT. VI.—WOUNDS OF THE DIAPHRAGM.

Wounds of this musculo-tendinous septum possess comparatively little practical interest, for not only is their diagnosis extremely difficult, but, even when their nature is ever so well understood, little can be done for their relief. Moreover, they are not only exceedingly dangerous in themselves, but they are often, if, indeed, not generally, complicated with serious lesion of the contents of the chest or abdomen, thus greatly increasing the risk.

Wounds of the diaphragm are generally inflicted with the knife, dirk, sabre, or sword. Their extent is, of course, very variable, and they may be either single or multiple. Occasionally a severe lesion of the diaphragm is produced by the sharp point of a fractured rib, with or without external wound. Gunshot injuries of this septum are sufficiently common in military engagements.

Laceration of the diaphragm is occasionally met with, generally as the result of a severe fall, in which the person, as he alights, receives the blow upon the chest or abdomen, the septum being, perhaps, rendered unusually tense at the moment by a forcible inspiration. The accident may also be caused by the passage of the wheel of a carriage, or by the body being tightly squeezed between two hard and resisting objects, as the buffers of a railway car.

The left side of the diaphragm suffers incomparably more frequently in this accident than the right, and the fleshy portion than the tendinous. The rent is nearly always longitudinal, or in the direction of the muscular fibres.

The signs of an injury of the diaphragm that is not immediately fatal are generally very equivocal. The most reliable, in a diagnostic point of view, are excessive shock, with great pallor of the countenance, difficulty of respiration, which is performed mainly with the aid of the intercostal muscles, pain in the region of the diaphragm, increased by motion, pressure, and expansion of the chest, intense precordial distress, and irregularity, smallness and feebleness of the pulse. In some cases the pain extends into the shoulder, along the course of the phrenic nerve. When the shock is conjoined with copious hemorrhage the sufferer is generally completely collapsed, and often dies without an effort on the part of the system at reaction. The direction of the wound sometimes affords important diagnostic information. When the opening in the diaphragm is capacious, the stomach and even a large portion of the bowel may escape into the chest, thrusting the lungs high up into its cavity, and thus proportionately diminishing the size of the abdomen.

The cause of death in wounds and rupture cf the diaphragm is usually shock, or shock combined with hemorrhage. An instance has been reported by Mr. Wheelwright, in which a rupture of the diaphragm, caused by a fall from a coach, proved fatal from hemorrhage. The extravasated blood filled the left cavity of the thorax. If the patient survives the immediate effects of the injury, he will be likely to perish from the resulting inflammation, which often extends far among the neighboring structures. When recovery occurs, the edges of the abnormal opening become gradually rounded off and callous, and the opening itself may, if not very large, be closed by adhesions of the thoracic and abdominal viscera.

The *treatment* of these lesions does not differ, in any respect, from that of injuries of the chest and its contents in general. Reaction is promoted by the usual means; if there is no copious hemorrhage the external wound is closed with suture and plaster, otherwise it is kept open, the patient lying on the affected side, in order to favor drainage; any tendency to excessive inflammation is counteracted by general and local bleeding, while cough and pain are allayed by anodynes administered in full doses

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CHAPTER XII.

DISEASES AND INJURIES OF THE JAWS, TEETH, AND GUMS.

SECT. I.—AFFECTIONS OF THE SUPERIOR MAXILLARY BONE.

THE superior maxillary bone differs from most of the other pieces of the skeleton, in having a large cavity, denominated the chamber of Highmore. This chamber, which is very diminutive in young subjects, is situated in the body of the bone, and is lined by a reflection of the mucous membrane of the nose, with the middle meatus of which it communicates by an opening, which, in the recent state, hardly equals the volume of a crow quill. Owing to this peculiarity of structure, the diseases of the superior maxillary bone are of a much more complicated character than those of the inferior, though they are, perhaps, not any more frequent. The most important affections of the chamber of Highmore are wounds, inflammation, abscess, mucous collections, and various kinds of tumors, especially the encephaloid.

1. *Wounds.*—Wounds of the sinus may be inflicted through the cheek, the alveolar process, the roof of the mouth, or the orbit of the eye; and in their character they may be incised, punctured, or gunshot. The bleeding is always slight, and the treatment of the accident involves no particular principles. Sometimes a wound in this situation is complicated with the presence of a foreign body, which maintains irritation, and impedes the cure. A middle-aged man, a patient of Dr. Donne, of Kentucky, had the antrum perforated with a small dirk-knife. The instrument entered at the orbit, wounding the eye, and breaking off in the cavity of the bone, from which it was extracted more than two years afterwards through the roof of the mouth, its situation being indicated by a black spot a short distance from the first and second molar teeth.

In gunshot wounds of the face, the ball sometimes lodges in the maxillary sinus, as in the cases recorded by Ravaton and Dupuytren. Joubert met with an instance in which a nail was driven, head foremost, into this cavity by a bullet, and Beclard has reported one in which the ferule of an umbrella was firmly implanted in it. All such accidents are necessarily followed by more or less inflammation and discharge, and their true nature can, in general, be determined only by the introduction of a probe along the fistulous openings which accompany them.

The proper *treatment*, in all cases where the foreign substance is retained, is to search for, and, if possible, to extract it. The same mode of management is necessary when a tooth or fragment of bone is forced into the cavity.

2. *Inflammation.*—Inflammation of the lining membrane of the maxillary sinus is uncommon. It may be developed under the influence of various causes,

of which the most frequent are external injury, suppression of the cutaneous perspiration, a syphilitic taint of the system, the inordinate use of mercury, and, above all, the irritation produced by a loose, carious, or necrosed tooth. Occasionally the disease is propagated from the mucous membrane of the nose, by mere contiguity of structure. The principal symptoms are pain, of a fixed and severe character, a sense of weight and heat, pulsation, aching of the molar teeth, and, in violent cases, fever. The cheek is often tender on percussion, and the integuments sometimes pit on pressure. An increased discharge, of a thin, watery, and fetid nature, from the corresponding nostril, is occasionally present. The pain generally extends to the surrounding structures, as the teeth, nose, orbit, and forehead. The above symptoms, which are always less marked in the chronic than in the acute form of the malady, are not diagnostic, and the practitioner should, therefore, always institute the most thorough examination before he finally decides on their value.

It is of great importance that this disease should be early recognized and properly treated, as its tendency, when neglected or mismanaged, is to run into suppuration and other mischief. Diseased teeth, or stumps of teeth, are, of course, removed, even when it is not very apparent that they are the cause of the inflammation. If the symptoms are severe, blood is taken from the arm, and by leeches from the cheek or the alveolar process; the bowels are freely evacuated with senna and salts; and the action of the heart is still further depressed, if necessary, by the exhibition of antimony and diaphoretics, the latter of which are particularly indicated when the inflammation has been induced by cold. Fomentations and the application of steam are often beneficial in assuaging pain and relieving morbid action.

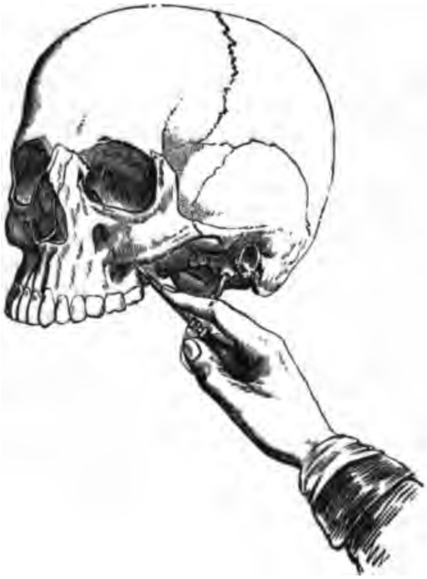
3. *Abscess.*—The formation of abscess in the antrum is denoted by an increase of the local and constitutional suffering, described as attending inflammation. The pain becomes more violent, and assumes a throbbing, pulsatory character, darting about in different directions, and being accompanied, in most cases, by a feeling of weight and tightness at the focus of the morbid action. Aching sensations are perceived in the teeth, the nose, and frontal sinuses; and there are often severe rigors alternating with flushes of heat. By and by, an erysipelatous blush appears on the cheek; the surface pits on pressure, and is exquisitely painful on the slightest touch. On raising the lip, the gum over the large grinders is found to be abnormally red and tumid, evincing the same increase of disease here as in the other situations. When the natural outlet of the sinus is not obstructed, there is often an escape of pus from the corresponding nostril, which, together with the symptoms just narrated, leaves no doubt respecting the true nature of the complaint.

The matter in this disease is rarely abundant, except in the chronic form, when it may amount to several ounces. It is generally of a thick, cream-like consistence, of a yellowish-green color, and highly fetid, apparently from its long retention. In the more violent grades of the disorder it is often intermixed with flakes of fibrin. In chronic abscess, the lining membrane usually undergoes serious structural changes, becoming thickened, flocculent, and even ulcerated, at the same time that the walls of the antrum are expanded in every direction.

Chronic abscess of the antrum is generally caused by dental irritation, or caries of the jaw-bone. In a very remarkable case, related by Professor Baum, each cavity was distended with purulent matter, in consequence of the lodgment of a tooth in its interior. The lining membrane was excessively thickened, but the osseous walls were greatly attenuated, and cracked like parchment under pressure. The patient was a woman, thirty-eight years old, and the disease, which had commenced in early life, had produced horrible deformity of the face.

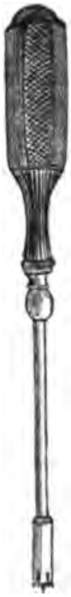
The *treatment* of abscess of the antrum is conducted on the same principles as that of abscess of the soft parts. The rule is to afford a free outlet to the pent-up fluid; if possible, before the occurrence of serious structural change. Such a step is not neglected even when there is no material obstruction in the natural orifice of the sinus, the insufficiency of this, from its elevated, and, consequently, unfavorable position, being well known. As the abscess is frequently directly dependent upon the irritation of a decayed tooth, or as some of the teeth are apt to become involved in the disorder, the safest and most expeditious way of affording relief is to extract the affected tooth, the fang of which often projects into the sac of the abscess, and only requires removal in order to let out its contents. Should the opening thus made be inadequate, it may easily be enlarged by means of a trocar, fig. 292, a triangular perforator, or the little drill, fig. 293, constructed upon the principle of a trephine. Patency is carefully maintained until the mucous membrane has regained its normal functions; an occurrence which may often be greatly expedited by the use of mildly astringent injections, and suitable constitutional measures. The tooth usually selected is the middle grinder, especially if it be diseased. When the abscess points at the alveolar process, the puncture may be made there, but with a result much less promising of ultimate success. The site of a tooth that has been long extracted should never be selected for the operation, as the bone at that place is always abnormally solidified.

Fig. 292.



Perforation of the antrum.

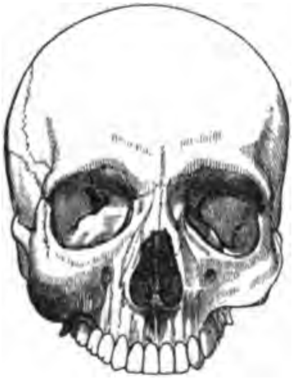
Fig. 293.



Pope's antrum drill.

4. *Accumulations of Fluid.*—The maxillary chamber is sometimes the seat of a species of dropsy, produced by the occlusion of its natural outlet, and the consequent retention of its natural secretion. The cavity, in fact, is placed in the same condition as a mucous crypt laboring under obstruction of its orifice; the result in either case being an encysted tumor, as in fig. 294. The retained substance may be simply of a thin watery character, or it may be thick and ropy like mucus, glairy and albuminous like the white of an egg, yellowish and oily like the contents of a joint, or pale and tremulous like jelly. Its quantity varies from a few drachms to a

Fig. 294.



Dropsy of the antrum.

number of ounces, according to the duration and activity of the disease. When very abundant, as it sometimes, though rarely, is, it expands the walls of the antrum in every direction, and thus causes the most hideous deformity of the corresponding side of the face. The cheek bulges out like an immense protuberance, the nose is thrown out of shape, the eye protrudes from its socket, the anterior naris is completely occluded, and there is great depression of the palate. The tumor fluctuates faintly under pressure, the teeth become loose, and the skin has a livid attenuated appearance. The disease is slow in its progress, and attended with hardly any pain: the general health remains good. In the worst cases, mastication, deglutition, speech, and respiration are interfered with. The affection is occasionally witnessed in young subjects, but is most frequent in middle age.

It is difficult to distinguish this disease from carcinomatous and other formations of the antrum. Its best diagnostic characters, perhaps, are the tardiness of its progress, the absence of pain, the want of enlargement of the neighboring lymphatic ganglions, and the preservation of the general health. In case of doubt, the exploring needle is employed, the swelling being carefully punctured at different points of its extent.

The *treatment* is based upon the same principles as that of abscess, evacuation of the contents of the chamber being effected at the most dependent portion of the tumor. The palate bulging, the opening is made there; or a decayed tooth is extracted, and the fluid is allowed to drain off along the resulting channel, widened, if necessary, by artificial means. Gradually the osseous cyst contracts, and re-accumulation being prevented, it is eventually obliterated, the process being often advantageously expedited by the use of mildly astringent injections. When the cure is very tardy, in consequence of the great bulk of the tumor, it may be well to cut away a portion of its outer wall, care being taken not to injure the integuments of the face.

5. *Effusions of Blood.*—It is not improbable that considerable effusions of blood occasionally occur in the maxillary sinus, either as a consequence of external injury, or as an effect of nasal hemorrhage, the blood passing into the sinus across the small aperture of communication. However this may be, it would not be likely, of itself, to be productive of any serious mischief; the most it could do would be to provoke suppuration. In such an event, the same treatment would be required as in ordinary abscess of the sinus.

6. *Fistule of the Maxillary Sinus.*—The antrum of Highmore is occasionally the seat of a fistule, caused either by external injury, by operations upon the jaw, or by the abnormal projection of the fang of a tooth. The passage, which is usually short and narrow, is generally situated in the alveolar process, though sometimes it is found on the cheek or on the roof of the mouth. Almost always solitary, it is sometimes multiple, and then opens both externally and internally. The diagnosis is commonly sufficiently easy, an escape of pus or of pus and mucus, and the existence of a small aperture either on the cheek or in the mouth, readily admitting a fine probe, being the most reliable phenomena of the presence of the malady.

A fistule in this situation often disappears spontaneously with the removal of the exciting cause. It is only when the opening is very large, as when it has been produced by the loss of a considerable portion of bone, that it will be likely to create trouble. In such a case the contraction of the abnormal passage may be greatly promoted by attention to cleanliness and by the use of stimulants, aided, occasionally, by the gentle application of a heated iron. When the fistule opens upon the cheek, and refuses to yield to the ordinary measures, a cure may be hoped for by freely paring its edges, and then carefully uniting them with the twisted suture.

7. *Polyps.*—It is rare to meet with polyps of the maxillary sinus. A great variety of morbid growths, having scarcely any common points of resemblance, have been described under this name, much to the detriment of sound pathology and practice. Perhaps the best specimen of a polyp of the antrum, and one which I have certainly more than once seen in my operations on the upper jaw,

is the sarcomatous, as it is vaguely termed. It is not easy, however, to describe this variety of tumor, so diversified and multiform are its component elements. Its most ordinary character is the fibrous, in which, as the name implies, there is a predominance of the fibrous structure, although there is often, if, indeed, not constantly, an intermixture of other elements, especially the cartilaginous; small cysts, cells, or cavities, containing various kinds of fluids, as serous, glairy, and sanguineous, are sometimes interspersed through their substance, and serve to give them a compound character. Few vessels are apparent in their structure, and hence they seldom attain any great bulk, or advance with much rapidity. For the same reason they do not bleed much when ulceration takes place, or when we attempt their removal. The color of these tumors varies; some are pink, some livid, some white and opaque, like an oyster.

Most of these tumors spring originally from the mucous membrane of the sinus; but occasionally their development begins in the proper substance of the bone, which, in this case, is gradually broken down and disintegrated, and ultimately lost in the new product. Their volume, though generally small, sometimes equals that of a fist; they manifest no malignant tendency, and rarely return after extirpation. Middle-aged persons are their most frequent subjects.

Polyps of the antrum are distinguished from encephaloid and other carcinomatous formations of the upper jaw, first, by the tardiness of their growth; secondly, by their globular, ovoidal, or pyramidal shape; thirdly, by their circumscribed character, or indisposition to ramify through the surrounding parts; fourthly, by their firm, unyielding consistence; fifthly, by their painlessness; and, lastly, by the absence of contamination of the neighboring lymphatic ganglions. There is, moreover, little tendency in such tumors to ulceration; the mucous membrane of the mouth retains its florid appearance; and there is much less sanguinolent discharge from the nose than in encephaloid. The general health is not deteriorated, and the countenance is free from that sallow and dejected expression which forms so striking and characteristic a feature in malignant disease.

A polyp of the antrum may occasionally be approached by the mouth, the outer wall of the cavity being opened just above the roots of the teeth. When the wall is very thin and soft, the operation may be performed with the knife; when the reverse is the case it may be necessary, in addition, to use a gouge and mallet. The cheek is, of course, detached from the bone for some distance as a preliminary measure. I have, on several occasions, removed polypoid tumors from the antrum in this way with very satisfactory results, and the plan should always, if possible, be adopted in preference to any other, as it is unattended with disfigurement of the face. When the morbid growth is uncommonly large, it will be necessary, as a general rule, to approach it through the cheek, as in the extirpation of malignant tumors, presently to be mentioned. Little hemorrhage usually accompanies such operations.

8. *Vascular Tumors.*—A tumor, having all the properties of an anastomotic aneurism, has occasionally been seen in the maxillary sinus. It is difficult to determine whether it takes its rise in the mucous membrane of the sinus, or in its bony walls. However this may be, it appears to consist essentially in an enlargement of the branches of the internal maxillary artery, which interlace with each other in every conceivable manner, and thus form a tumor of an erectile character, similar to nevus of the face. As the affection progresses, the walls of the antrum are absorbed, and the morbid growth becomes subcutaneous, feeling like a soft, spongy mass, and exhibiting a bluish, purple, or modena color. Its pulsation, which is synchronous with the contraction of the left ventricle, is very distinct under the finger, and may generally be seen at some distance. When the tumor is very large, it encroaches upon the eye, nose, and mouth, and is productive of great deformity.

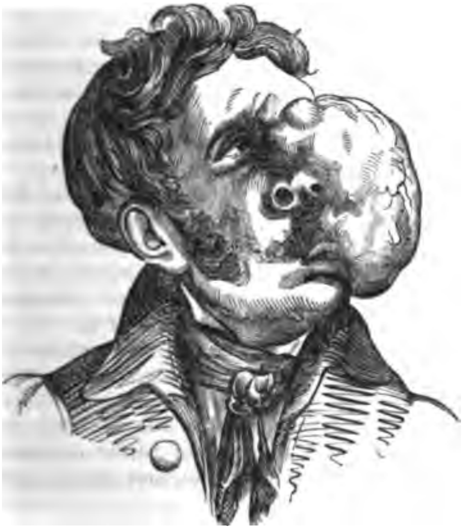
The prominent *symptoms* of the disease are, its steady increase, its tendency to encroach upon the surrounding parts, its soft, spongy consistence, its pulsatory movements, and the livid discoloration of its surface, both external and internal. The attendant pain is usually slight, and the general health is seldom impaired, until after the establishment of nasal hemorrhage, which is sure to set in sooner or later, and which is often profuse and draining in its effects.

If the tumor be seen early, or, rather, if it be recognized before it has attained any considerable bulk, the proper procedure would be to expose it by a careful dissection, and effect its destruction with the actual cautery, the Vienna paste, or acid nitrate of mercury. Perhaps a portion of the growth might be constricted with the ligature, as in the operation for the radical cure of hemorrhoids. When it has attained a large size, ligation of the common carotid artery, as proposed and practised by the late Professor Granville S. Pattison, may be tried, although, it must be confessed, with but a faint prospect of success.

9. *Encephaloid.*—By far the most frequent, as well as the most formidable disease of the chamber of Highmore, is encephaloid, osteocephaloma, or soft cancer, which occurs here, as elsewhere, in both sexes, in all classes of individuals, and at all periods of life. I have witnessed it in children under five years, in young adults, at middle life, in old age, and in decrepitude. It is, however, undoubtedly most common between the twentieth and fortieth years. It is not known what influence, if any, occupation, temperament, climate, and other circumstances exert upon the development of this disease. In all the instances of it, except one, that have fallen under my observation, it arose without any obvious cause.

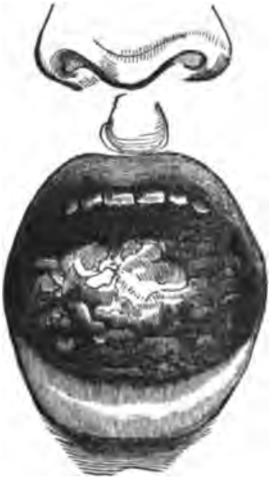
The malady usually begins in the cavity of the antrum, in connection with the mucous membrane. Occasionally it takes its rise in the cancellated structure of the bone, in the socket of one of the molar teeth, in the gum, or in the periosteum. In the first case, it generally progresses until it fills up the whole sinus, after which it encroaches upon the bony parietes of the cavity, pushing them out in every direction, and thereby pressing them against the surrounding structures. As the external wall is extremely thin, in fact a mere shell, in the natural state, the morbid growth commonly advances more rapidly in this direction than in any other, forming thus, frequently at an early stage, quite a large tumor on the cheek. By and by, as it proceeds in its development, it extends towards the nostril, partially, and sometimes completely, occluding the corresponding cavity; upwards towards the floor of the orbit, compressing and ultimately protruding the ball of the eye; downwards towards the palate, displacing the tongue, and diminishing the mouth; and backwards towards the fauces, impeding mastication, deglutition, speech, and respiration. At this stage of the disease, the

Fig. 295.



Encephaloid of the antrum, encroaching upon the face.

Fig. 296.



Encephaloid of the antrum encroaching upon the mouth.

countenance is most hideously disfigured, and the patient is an object well calculated to excite commiseration. The appearances here described are well seen in figs. 295 and 296.

The integuments and mucous membrane are generally sound in the earlier stages of the complaint; but after a certain period, varying from several months to a year, they begin to assume a lived and congested appearance, and at length yield to ulcerative action. The consequence is a fungating and rapidly spreading sore, the seat of a thin, sanious, muco-purulent, or sanguinolent discharge, very abundant, excessively fetid, and highly irritating. Pure blood often proceeds from it; sometimes very small in quantity, at other times so copious as rapidly to undermine the strength, and bring on hectic fever, with exhausting night-sweats.

In the latter stages of the disease, sometimes before, but generally not until after ulceration has set in, the lymphatic ganglions of the temple, behind the ear, and under the jaw, become enlarged and contaminated, and finally give way from over-distension. The countenance assumes a peculiar cadaverous expression; the patient rapidly loses flesh and strength; colliquative diarrhœa supervenes; the pain is excessive; and death finally occurs from exhaustion. The progress of the malady is variable; sometimes very rapid, at other times quite tardy. I have seen death produced by it in less than six months from its commencement; and, on the other hand, I have met with cases in which the fatal event did not take place under four years. The affection, according to my experience, is usually more rapid here, as elsewhere, in children and youths than in the middle-aged and old.

When such a tumor is inspected after removal, it is found to exhibit all the characteristics of encephaloid formations generally. That portion which occupies the antrum is commonly quite soft and pulpy, resembling, at least faintly, both in color and consistence, a section of the brain. The osseous structure is broken down and disorganized, quite vascular, and so soft as to be easily cut. In some places, and in some specimens, it is entirely, or nearly entirely, absorbed; while in others it is replaced by fibro-cartilage, or cartilage, intermixed with spicules and scales, remnants of the original tissues. In the majority of cases, the morbid growth is remarkably vascular, being pervaded in every direction by large vessels, the walls of which are exceedingly brittle, and, therefore, liable to yield under the slightest impulse. It is owing to this circumstance that these tumors frequently attain such an enormous bulk, and that, when ulceration sets in, they are so liable to fungate and bleed.

The *diagnosis* of encephaloid of the superior jaw, however commencing, is usually not difficult. The rapid growth of the tumor, its steady encroachment upon the adjacent parts, its soft and elastic feel, the livid aspect of its buccal portion, and its sharp, darting pains, readily distinguish it from all other formations of this division of the skeleton. In the latter stages of the affection, the fungous character of the ulcer, and the sanious, sanguinolent, and bloody discharges, together with the sallow and cadaverous state of the countenance, and the enlargement of the neighboring lymphatic ganglions, leave no doubt about its real nature. Important information will also be furnished by the history of the case, and by the fact that encephaloid occurs at all periods of life, while some of the other morbid growths of this region are seen only at certain ages.

When any doubt exists respecting the character of the tumor, no objection lies against the use of the exploring needle, which will at once inform us as to the consistence of the morbid product, and the nature of its contents. If it be encysted, an escape of serum, or muco-sanguineous fluid, will afford the necessary intelligence, and enable us to shape our course accordingly. Should encephaloid matter be present, the smallest particle will, if subjected to the microscope, reveal the characteristic cancer cell.

Encephaloid of the jaw seldom coexists with malignant disease in other parts of the body. The affection, in fact, in the great majority of instances, is more local in its character than when it invades the cellular tissue, eye, or glandular organs. It is, doubtless, owing to this circumstance that excision of the disease, especially in its early stage, is occasionally successful, though, in general, the prognosis is most unfavorable.

10. *Scirrhus.*—Scirrhus of the upper jaw is extremely uncommon; I have never seen an instance of it, and what is usually described as such is doubtless merely encephaloid. If it should ever occur here, it would be most likely to show itself in advanced life, as a hard, firm, solid tumor, slow in its progress, and characterized by sharp, lancinating pain. It would not attain as great a bulk as soft cancer; nor would it be so liable to fungate and bleed. Of colloid and melanosis of the upper jaw, we are entirely ignorant.

11. *Exostosis.*—The superior maxilla is liable to exostosis. The morbid growth, varying infinitely in regard to its size and form, is most common in old and middle-aged subjects; it may appear upon any part of the bone, and, gradually augmenting in volume, may at length involve its entire extent. It is strictly a local affection, the result generally of external violence, or of a syphilitic taint of the system; and rarely, if ever, degenerates into malignant disease.

An exostosis is easily recognized. Its chief peculiarities are, its excessive hardness, its slow growth, its freedom from pain, the absence of disease in the surrounding structures, and the unimpaired state of the general health. There is no discharge of blood, mucus, or pus, no tendency to ulceration, no alteration, at least not for a long time, in the skin of the face, or in the lining membrane of the mouth: the principal inconvenience is from the size of the morbid growth, which is occasionally enormous, and from its consequent interference with the functions of the adjacent parts. When doubt exists, a small exploring needle, introduced at various points of the tumor, will at once decide the question.

Little is to be accomplished in this disease by medical treatment. When the tumor is young and small, the external and internal use of iodine may be serviceable in diminishing, and even in eradicating it. A mild mercurial course, conjoined with the internal exhibition of iodide of potassium, is indicated when it is dependent upon a syphilitic taint of the system. A growth of this kind has been known to drop off spontaneously. But such an event is not to be looked for, nor, as before stated, is much to be expected from therapeutic agents. In general, nothing short of extirpation will answer, and this, fortunately, is usually readily accomplished by the ordinary means.

12. *Hypertrophy.*—A very singular enlargement of the superior jaw, constituting a species of partial hypertrophy, and depending upon the irritation of an inverted tooth, is occasionally met with. An instance of the kind, the only one I have ever seen, fell under my observation in 1843, in a young lady, aged twenty-one. The enlargement, which had been first noticed two years and a half previously, and which was about the volume of a large hickory-nut, occupied the alveolar process of the left jaw, and was of a hard, firm consistence, free from pain and soreness, unaccompanied by disease of the gum, or derangement of the general health, and formed at the expense mainly of the outer plate of the bone. Upon sawing into the tumor, it was found to be occupied by a cuspid tooth, a little smaller than natural, but well grown, with the crown reversed, or directed upwards towards the antrum of Highmore. The parts soon healed, with hardly any defect, save what resulted from the extraction of the canine tooth, which was deemed necessary as a preliminary step.

13. *Atrophy.*—Instead of being enlarged, the upper jaw is sometimes atrophied, so as to give the antrum and, of course, also the cheek, a peculiarly hollow, sunken or depressed appearance. Such an effect may be produced by external injury or by a diseased tooth, but it may also, as in a remarkable case reported by Mr. White Cooper, arise spontaneously, or, more properly speaking, without any obvious cause. In this case, the change seems to have been owing to a gradual retrocession of the anterior and superior walls of the maxillary sinus, with a corresponding diminution of its cavity. The affection was unaccompanied by pain, but the patient, a female, aged twenty-eight, labored under constant epiphora, and was seriously disfigured in consequence of the peculiar state of the cheek. The nasal fossa was somewhat lessened in size, and the mucous membrane

preternaturally dry. When Mr. Cooper first saw the case, it had already been in progress for seven years.

14. *Encysted Tumors.*—In 1860, I saw, at the clinic of the Jefferson College, in an old man, a patient of Dr. Piper, an encysted tumor of the upper jaw, evidently formed in the areolar structure, just above the lateral incisor and cuspid teeth. It was about the volume of a lime, and distinctly fluctuated under pressure, its anterior wall cracking like parchment. Its contents were of a serous character. The tumor being opened with a stout knife, its secreting surface was freely touched with chromic acid, a tent being afterwards introduced to keep up the irritation. Healthy granulations soon sprung up, and in less than two months the cavity was completely obliterated.

EXCISION OF THE UPPER JAW.

Excision of the upper jaw is required chiefly in malignant disease, and under such circumstances it may be necessary to remove, at the same time, portions of the malar, turbinated, ethmoid, and sphenoid bones, which are often involved in the morbid action. A part of this bone was removed by Acoluthus, as early as 1693; but the honor of first extirpating the whole of it is due to the late Dr. Jameson, of Baltimore, who achieved the enterprise successfully in 1820.

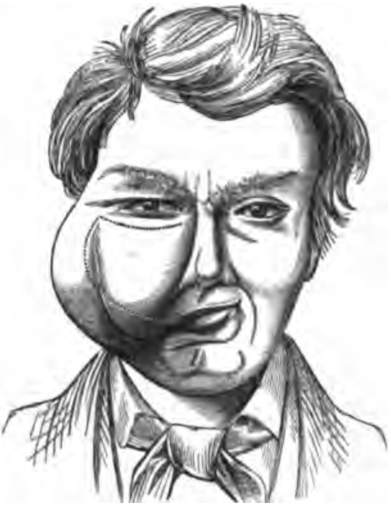
The patient, during the operation, should always be placed recumbent, especially if the tumor is of considerable bulk, and a good deal of time is required to effect its removal. The head and shoulders should be well elevated, and the face inclined towards the opposite side. Very few persons, whatever may be their courage or fortitude, can bear the shock and fatigue of an undertaking of such magnitude in the sitting posture. This precaution is the more necessary if chloroform is given, as I always do in such cases. I am aware that objections have been urged against the administration of this remedy in operations on the mouth, but without, I believe, any just reason. Be this as it may, I have employed this agent, ever since its introduction into practice, in all the amputations, both of the upper and lower jaw, that have fallen under my observation, and I have certainly, thus far, had no cause to regret it. The mouth can always be easily cleared of blood, even if the patient is unconscious, with the finger, or a sponge-mop.

I have never found it necessary, in any of my operations on the upper jaw, to secure the carotid artery, as a means of preventing hemorrhage. Indeed it is surprising that such a procedure should ever have been recommended, much less practised, by any one. My experience is that there are no structures in the body, of the same extent, in their natural and diseased condition, the removal of which is attended with so little hemorrhage. No skilful surgeon now even employs compression of the carotid artery in these operations, and, as to tying that vessel as a means of security against loss of blood, I should as leave think of ligating the femoral artery for the same purpose. Nothing, it seems to me, could be more absurd and unnecessary. The chief danger from hemorrhage is in the subcutaneous arteries, especially the facial and its branches, and these are always readily controlled by the ligature. The deep-seated arteries, involved in tumors of the upper jaw, seldom bleed much, if care is taken to keep beyond the limits of the diseased tissues. If this precaution is neglected, the hemorrhage may be copious, if not exhausting. The oozing which takes place from the osseous surface, after the exsection is completed, in general speedily ceases of its own accord from the contact merely of the air; when it does not, it is usually easily arrested by compresses wet with a saturated solution of persulphate of iron. The actual cautery can only be required when the vessel is entirely beyond the reach of the ligature, or when a portion of the disease has unfortunately been left behind.

The direction, extent, and number of the incisions through the soft parts must necessarily vary with the situation and volume of the tumor. In all these respects, much must be left, in every case, to the judgment and experience of the operator. When the morbid growth is comparatively limited, and seated upon the anterior, or antero-lateral, aspect of the jaw, we shall generally be able to dispense with external incisions altogether, as our object may readily be accomplished simply by dissecting off the lip from its attachments to the bone, and holding it out of the way with a finger or blunt hook. The surface of the tumor having thus been thoroughly denuded, the bone is attacked with the pliers, and severed fairly beyond the line of the disease. By this procedure, which is admirably adapted to the more simple forms of morbid growths, the operation is divested of much of its severity, and not followed by any deformity of the features, save what results from the caving in of the integuments.

When the tumor involves the body of the jaw, and is of considerable bulk, the plan which I usually adopt, is to make one long, curvilinear incision, extending across the most prominent part of the tumor, from the commissure of the lips towards the zygomatic process of the malar bone, terminating within a few lines, half an inch, or an inch, of the external angle of the eye, according to the exigencies of the case. In this manner are formed two flaps, the upper of which is convex, and the lower concave, which are then carefully dissected up by bold and rapid strokes of the knife, and held out of the way by trustworthy assistants, who, at the same time, take care to compress the bleeding vessels. The space which this procedure affords is, in general, quite sufficient for the easy removal of the entire tumor, however large or extensive its connections. In my own cases, it has always answered the purpose most thoroughly. Should it, however, be inadequate, it can readily be increased to the requisite extent by carrying the knife horizontally along the inferior border of the orbit, as far over as the nose, as exhibited in fig. 297, from a patient affected with encephaloid disease of the antrum, whom I attended with Professor Pancoast. In making the first of these incisions, the facial artery is necessarily divided, and, in the second, the superior maxillary nerve, together with many of the branches of the portio dura of the seventh pair. In consequence of the injury thus sustained, the parts supplied by these nerves remain a long time paralyzed, though ultimately the face regains, in great degree, its accustomed power and expression.

Fig. 297.



Lines indicating the course of the knife in excision of the upper jaw.

When the tumor, or enlargement, occupies the anterior and upper portion of the jaw, the external incision may extend vertically upwards by the side of the nose, from the free border of the lip to a level with the orbit of the eye. This will enable the operator to detach the wing of the nose, and to remove, if necessary, the ascending process of the jaw-bone, the lachrymal bone, the inferior turbinated bone, and even the vomer, as I have been compelled to do in several instances.

When the antrum is mainly implicated in the disease, two incisions, representing the form of an inverted L, are necessary, the vertical limb corresponding with the ascending process of the maxillary bone, and the horizontal one with the inferior border of the orbit of the eye.

Whatever may be the form and direction of the incisions, care should be taken that they are sufficiently extensive to afford ready access to the diseased mass. Nothing can be more embarrassing, or display greater defect of judgment in the operator, than a want of room in a case of this kind.

The necessary incisions having been made, and the flaps dissected up, the next step is to remove the tumor. As a preliminary measure, two teeth, one in front and the other behind, must be extracted, to make room for the play of the saw and other instruments. As a general rule this part of the operation should be performed as soon as the patient is fairly under the influence of chloroform, and, consequently, prior to the division of the soft structures. If done after that, it is liable to occasion delay and annoyance.

The separation of the jaw is generally the work of a few minutes. The limits of the disease being usually well defined, care must be taken to keep on the outside of them, for the twofold purpose of avoiding hemorrhage, and removing the whole of the morbid structures. The best contrivance for executing this part of the operation is a pair of pliers. The surgeon should supply himself with at least three of such instruments, of different shapes and sizes, figs. 298, 299, 300, as one is rarely sufficient for the purpose. He should also have several chisels, small saws, a lenticular, and a stout scalpel, the handle of which should terminate in a steel point, that it may be used as a scraper and a cutter, as may be found expedient.

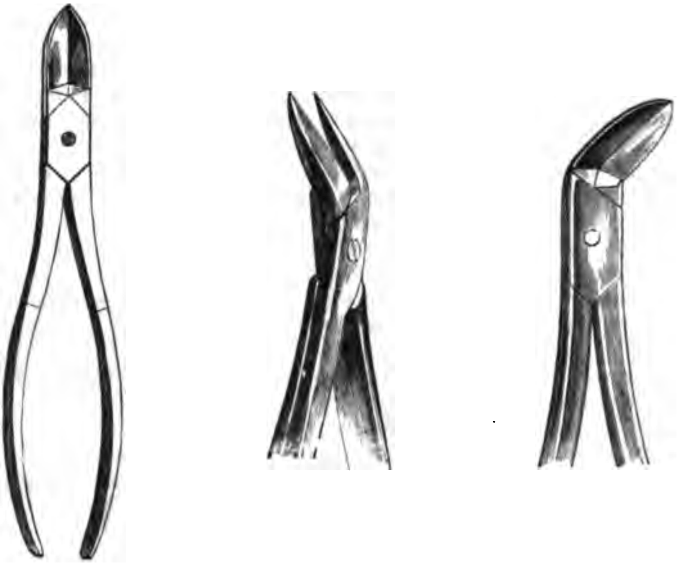
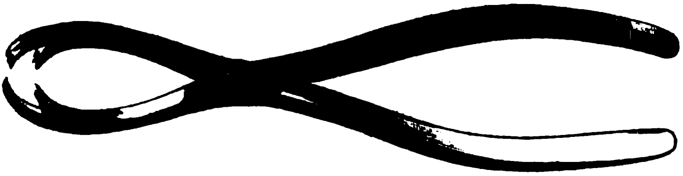


Fig. 298. Fig. 299. Fig. 300.

Different forms of bone forceps.

When it is designed to remove the entire jaw, the saw or pliers should be successively carried through the alveolar process in front, and the horizontal plate behind, close to the middle line, as far back as the corresponding portion of the palate bone; the mucous membrane of the roof of the mouth having been previously divided with the scalpel, to prevent it from being bruised and lacerated. Next, the instrument is to be applied to the malar bone, at or near its junction with the maxillary, and, finally, to the nasal process, which is generally divided on a level with the lower margin of the orbit. The orbital plate of the jaw-bone is commonly left intact, at least in part, as it rarely participates in the morbid action. Should it do so, however, it should be cautiously removed with the chisel and knife, lest the eye and its appendages be injured. All that now remains to be done is to sever the tumor at its junction with the pterygoid process and palate bone; and here, again, the chisel and knife will come into excellent play. Occasionally the bones, after having been pretty well severed, may be forcibly wrenched from their bed by grasping them firmly with the lion forceps of Fergusson, represented in fig. 301. The main tumor having been removed, the parts are carefully sponged, and any remnants of diseased substance that may appear are cleared away with the lenticular, gouge, and other suitable instruments.

Fig. 301.



Clawed forceps.

It is seldom that more than three or four ligatures will be needed. To stop the oozing of blood from the deep portion of the wound, and counteract the sinking in of the cheek, the bony gap should be well stuffed with lint, wet with a saturated solution of persulphate of iron. The external wound is closed with the twisted suture, and supported by a compress, secured by a roller, passed round the head and chin in the form of the figure 8.

Excision of both superior maxillary bones was originally performed, in 1844, by Dr. J. F. Heyfelder, on account of carcinoma. The operation has since been repeated by Maisonneuve, Dietz, Jüngken, Langenbeck, and other surgeons. Dieffenbach, in 1848, removed the greater part of both upper jaw-bones, along with the palate and malar bones. Should such an operation be necessary, access to the diseased structures could readily be obtained by two curvilinear incisions, extending from the commissures of the lip to within a short distance of the outer angle of the eyes.

The *after-treatment* is strictly antiphlogistic; and, as the great danger to be apprehended is erysipelas, every means should be used to avert its occurrence. The needles are removed at the end of the third day, when the edges of the incision will generally be found to be perfectly united. I have repeatedly seen wounds, eight and nine inches in length, close by the first intention after these operations. The patient soon becomes accustomed to his loss; and the function of deglutition, at first so difficult and annoying, is gradually performed with its original facility. Even the faculty of mastication is regained much more rapidly than one, unacquainted with the compensating powers of nature, might be led to suppose. The deformity of the face is often comparatively trifling; and the defect in the mouth may usually be remedied, in the more favorable cases, by artificial means. It is surprising how much, even in a short time, the cavern contracts, and how all the surrounding and associated parts accommodate themselves to their new situation.

When the tumor is encephaloid, it may confidently be assumed that it will return, sooner or later, in almost every instance, however thoroughly it may have been extirpated. In the non-malignant formations, on the contrary, there is no reason to apprehend a relapse, any more than in the same class of affections in other parts of the body.

SECT. II.—AFFECTIONS OF THE INFERIOR MAXILLARY BONE.

The lower jaw-bone is subject to various affections, of which the principal are abscess, caries, necrosis, and different kinds of tumors.

1. *Chronic Abscess.*—The lower jaw, like other bones, is liable to the formation of a circumscribed abscess, small in size, slow in its progress, lined by a distinct membrane, and filled with strumous matter, the affected tissue being much increased in bulk and density. The disease, which has hitherto been observed chiefly in young subjects, may be caused by external injury, by cold, by the action of phosphorus, or by the irritation of decayed teeth. The symptoms are generally obscure, the most prominent being a gradual enlargement of a particular portion of the bone, with a sense of excessive hardness, more or less

tenderness on pressure, and fits of acute pain, recurring at variable intervals, with difficulty of separating the jaw and of masticating, and gradual failure of the health. The treatment consists in exposing the abscess with the trephine and evacuating its contents. If the textural lesions are very great, complete excision of the affected parts may be necessary.

2. *Caries.*—Caries of this bone does not require any particular notice, as it is neither frequent in its occurrence, nor peculiar in its character. Various causes may induce it, as external injury, the irritation of a decayed tooth, mercurialization, or a scorbutic, strumous, or syphilitic taint of the system. Whenever it takes place, the nature of the exciting cause should, if possible, be traced out, and the case treated accordingly.

3. *Necrosis.*—Necrosis is also uncommon, being witnessed principally as a result of profuse ptyalism, especially in young and weakly persons, of a strumous temperament. Large portions of the bone, along with the corresponding teeth, are often destroyed by this cause in this country, where mercury is given with such a profuse and daring hand. I have known cases where, from the effects of salivation, more than one-half of the bone perished and finally sloughed away. The inflammation which precedes and accompanies the necrosis frequently involves the soft parts, producing extensive mortification, and the most horrible deformity of the features. Fortunately, such cases are becoming every year less common among us; for the vile and unmeaning practice upon which they generally depend is fast falling into desuetude. One of the worst things connected with these occurrences is the permanent closure of the jaw by the inodular tissues, which are generally extremely firm, and exhibit the same tendency to contraction as the inodular tissues of a burn. The poor sufferer, in consequence, is often unable to move the bone in the slightest degree, except, perhaps, a little laterally, and he has the greatest difficulty in feeding himself. I have seen many cases in which the power of mastication was utterly destroyed, and where the food was obliged to be chopped as finely as possible before it could even be introduced into the mouth. Articulation, of course, is impeded, and the patient, if young, must necessarily suffer in his education. In a word, I know of no class of human beings who are more deserving of our commiseration and skill than this, or who have more reason to complain of the carelessness and incompetency of medical practitioners.

Necrosis is always easily distinguished by the denuded state and whitish appearance of the affected bone, by the existence of purulent discharge, and by the excessively fetid state of the breath. The part, when struck with the probe, emits a peculiar ringing sound, very different from that of healthy bone.

The *treatment* consists in attention to cleanliness and the removal of the sequesters. To fulfil the first intention, free use is made of chlorinated washes, along with such remedies as may have a tendency to improve the general health. The dead bone may be withdrawn with the fingers, or, with the fingers and forceps, the latter being always handled with the greatest care and gentleness. When the piece is very large, the operator may be compelled, as a preliminary step, to cut the gum, or even to divide the dead bone itself with the saw or pliers, but an external incision will seldom be required in any case, however extensive. When the whole of the lower jaw is necrosed, the proper procedure is to divide it at the chin, and to draw out each half separately; the knife being employed wherever it may be necessary on account of the resistance of the soft structures. When these precautions are used, and the operation is postponed until the sequestration is entirely, or at least measurably, completed, I feel satisfied that there will seldom be any need of interfering with the skin. The entire lower jaw, affected with necrosis, was thus removed by Dr. George McClellan in 1823.

4. *Lucifer Match Disease.*—Within the last fifteen years, the attention of the profession has been called to a singular species of necrosis of the lower jaw dependent upon the injurious effects of the fumes of phosphorus in the manufacture of lucifer matches. In this country, it was first noticed by Dr. James R. Wood, who gave an account of it in the New York Journal of Medicine for May, 1856, accompanied by the history of a case in which he removed the entire lower max-

illary bone for the cure of this disease. In order to produce its specific impression, it would seem to be necessary that the vapor should come in immediate contact with the periosteum, or the alveolar process of the bone; hence it is alleged that those only who have carious teeth are liable to suffer from it. There are, however, some pathologists who assert that the phosphorus is absorbed into the system, and that its effect upon the jaw is altogether secondary, acting very much in the same manner as mercury. However this may be, the disease is essentially inflammatory, and gradually terminates in a loss of vitality, sometimes so extensive as to involve the entire bone. Its approaches are usually slow and insidious, the parts feeling merely somewhat tender and painful, as so often happens in slight toothache. The disease, in fact, is at first quite chronic. By and by, however, it acquires new activity, and then rapidly accomplishes its work, the local and constitutional disturbance being excessive, especially if abscesses form, and the mortification extends to the soft parts. Under such circumstances, it is not uncommon for the patient to die.

Of 51 cases of this disease, observed by Von Bibra, of Nuremberg, both jaws were affected in 5, the lower in 25, and the upper in 21. What is remarkable is that, while the inferior bone is not unfrequently involved in its entire extent, in the superior the necrosis is generally limited to the alveolar border or to this border and the palatine process.

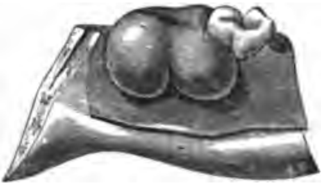
The *treatment* of the disease, in its earlier stages, is the same as in periostitis from any other cause; by leeches, incisions, astringent and detergent lotions, and general antiphlogistic means. Tonics will be demanded when there is profuse suppuration, or when the mortification extends to the soft parts. In the latter case, the best topical remedy will be dilute nitric acid, acid nitrate of mercury, or nitrate of silver, with chlorinated washes.

Surgical interference is required when the dead bone has become measurably detached; it may be removed entire, or piecemeal, according to circumstances. In general, the operation may be satisfactorily performed without any external incision, even when the whole bone is involved. When the periosteum remains intact, nearly the whole jaw may be almost completely reproduced, as in the interesting cases recorded by Geist.

5. *Exostosis.*—Exostosis of the lower jaw is very rare. It is generally situated between the angle and symphysis of the bone, and is capable of acquiring an enormous bulk. Its cause may sometimes be traced to external injury, or to the irritation of a decayed tooth, which has occasionally been found completely encapsuled by the morbid growth. The disease is slow in its progress, and seldom productive of any other inconvenience than that which results from its mechanical obstruction. The treatment is similar to that of exostosis in other parts of the body.

The lower jaw is sometimes expanded, at one particular point, into a hard, firm, solid tumor, constituting a species of local hypertrophy. The density of the affected part is occasionally equal to that of ivory. In 1851, Dr. Pinkney, of the Navy, showed me a piece of the body of the inferior maxillary bone, which he had removed for a disease of this kind from a man at Lima, and which was so hard that he found it almost impossible to divide it with the saw. An account of the case has been published in the twelfth volume of the American Journal of the Medical Sciences.

Fig. 302.



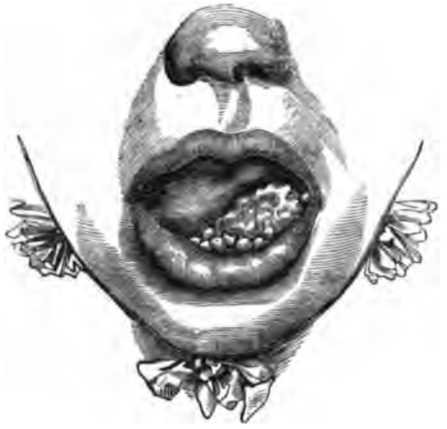
Epulis, in its earlier stages.

6. *Epulis.*—One of the most common affections of this bone is epulis, of which the annexed drawing, fig. 302, from one of my patients, affords a good illustration in its earlier stages. It originally consists of a small, fleshy-looking tubercle which, as its name implies, projects from the gums, though it is doubtful whether it ever arises there. From what I have seen of it, I am inclined to believe that it generally, if not always, begins in the socket of one of the teeth,

usually one of the molar, from which it gradually extends upwards until, in many cases, it forms a growth of considerable volume. It is of a dense, firm consistence, of a florid color, and of a peculiar fibrous structure. Its shape is irregularly rounded, somewhat like a mushroom, its point of attachment being usually much smaller than its free extremity. When first noticed, it has generally the appearance of a little excrescence, situated at the side of one of the teeth, which, in time, becomes loose, and ultimately drops out. During its progress, which is commonly rapid and painful, it extends in different directions, forming a mass which fills up a considerable portion of the mouth, and which interferes essentially with mastication, articulation, and even deglutition and respiration.

Fig. 303, from Druitt, exhibits this disease in its advanced stages, encroaching seriously upon the mouth, and impeding the movements of the tongue and jaws.

Fig. 303.



Epulis, which, having existed many years, interfered with the movements of the tongue and jaw, and so produced great emaciation.

It is difficult, in the present state of the science, to classify this morbid growth. Most writers seem to regard it as belonging to the cancroid varieties of disease, and it certainly approaches these affections more nearly, in its progress, symptoms, and reproductive tendencies, than any other with which we are acquainted. In all the cases that have fallen under my observation, and their number has been considerable, the repullulating disposition has been most remarkable. As to its exciting causes, absolutely nothing is known. It occurs in both sexes, and at all periods of life, though young persons appear to be most subject to it. In cases of long-standing, the surface of the tumor ulcerates, and becomes the seat of severe pain, with a fetid, sanguinolent discharge. The neighboring lymphatic ganglions enlarge, and the constitution evinces signs of contamination. The time at which the disease destroys life varies from twelve months to three years.

The only remedy for this affection is early and thorough excision, not of the tumor, or of the parts from which it grows, but of the portion of the bone in which it has its origin. I am satisfied that it is worse than useless to temporize with such a malady; the only way is to deal it at once an effectual blow by sawing out a piece of the jaw, embracing its entire thickness, and reaching some distance beyond the limits of the morbid mass. I have never known a case in which any other procedure did the least good. In treating epulis, we should not lose sight of the fact that it is an affection, not so much of the gums as of the jaw-bone; and, therefore, anything short of the removal of this, at the site of the disease, is an absurdity.

7. *Cystic Disease.*—The cystic tumor of the lower jaw is uncommon, and altogether devoid of malignancy. Its ordinary site is the alveolar process, where it may attain the volume of a hen's egg, or even of a large orange. It is composed of a distinct cyst, of a fibrous texture, thin, and transparent, or slightly opaque, and is occupied by a serous, sanguinolent, or glairy, mucilaginous fluid. Sometimes, though rarely, there are several such sacs, either closely connected together, or separated by an osseous septum. The bone around the tumor is expanded into a thin, elastic, crackling, parchment-like shell, and is easily penetrated by a sharp instrument, the puncture giving vent to the characteristic contents of the cyst. This, in fact, is the best diagnostic sign of the morbid growth. The disease is always tardy in its progress, and manifests no disposition to ex-

tend among the adjacent structures. The general health remains unaffected. When any doubt exists as to the real nature of the case, recourse should be had to the exploring needle, which will usually at once dispel it.

It is seldom that this tumor requires removal of the affected bone. In general, it will suffice to puncture it occasionally with a small trocar, to evacuate its contents, the escape of which is often followed by the rapid contraction and ultimate obliteration of the sac. Something, too, may be done, in such cases, by graduated compression. When there is a strong tendency to re-accumulation, a large opening may be made, and a tent inserted; or the necessary inflammation may be provoked by injections of weak solutions of iodine. It is only in old and intractable cases that excision of the bone, at the site of the disease, will be likely to be required.

The disease to which writers have usually applied the vague and unmeaning terms *osteo-sarcoma* and *spina ventosa*, is, in general, merely an exaggerated form of the cystic tumor just described. It is by far the most common of the benign formations of the lower jaw. Appearing at all periods of life, it is most frequent in young adults, and is capable of acquiring an immense magnitude. Several instances have fallen under my observation in which its volume was so great as to cause the most hideous and disgusting deformity. Always slow in its growth, the tumor is free from pain, never affects the constitution, and does not return after extirpation. The most common site of it is the body of the bone, but cases occur in which nearly the whole jaw is involved. The surface of the tumor is generally lobulated, and of unequal consistence, some parts being very hard and firm, others soft and fluctuating. The subcutaneous veins are rarely much enlarged, and there is no contamination of the neighboring lymphatic ganglions. When the tumor is very voluminous, it may encroach seriously upon the mouth and throat, interrupting speech, mastication, and deglutition; but, commonly, it enlarges mostly at the expense of the cheek, which is often frightfully distorted in consequence. The external appearances of this form of tumor are well shown in fig. 304, from a private patient, a young man of nineteen.

Fig. 304.

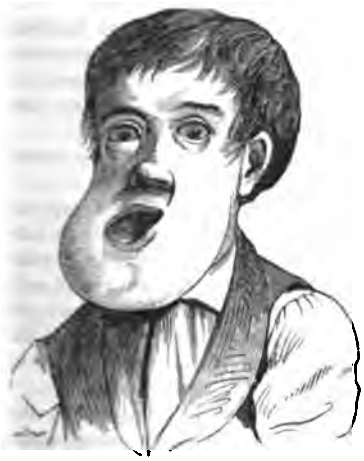
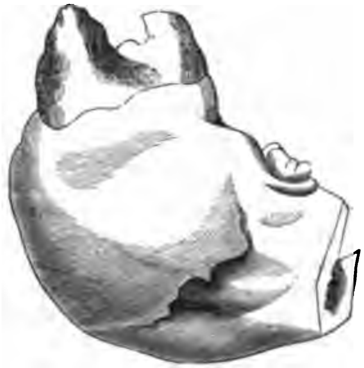


Fig. 305



Cystic tumor of the lower jaw.

The *structure* of this growth is essentially composed of cells, filled with various kinds of fluid, as serous, glairy, sanguineous, and purulent, surrounded and traversed by osseous spicules, and fibrous, fibro-cartilaginous, and cartilaginous septa. The cavities vary very much in size and figure, and it often happens that several communicate with each other. The compact structure of the bone is generally absorbed, softened, or broken up; and, occasionally, the greater portion of it is converted into a hollow shell, separated into different compartments, and occupied by different kinds of fluids. The adjoining cut, fig. 305, exhibits an enormous cystic tumor of the lower jaw, which I removed, some years ago, from a man upwards of forty years of age. It had been growing for sixteen years. The operation was completely successful.

The *diagnosis* of this disease cannot be mistaken. The tardiness of its development, its unequal consistence, its fluctuating feel, and its outward growth, together with the absence of local and general contamination, are sufficient to distinguish it from all other affections of the jaw. In cases of uncertainty, the exploring needle is employed. Sometimes the tumor, especially when composed of large cavities, sounds, on percussion, like a dice-box, a noise which is never heard in carcinoma.

Relief is afforded by excision of the diseased mass; and it is here, more particularly, that modern surgery has achieved some of its proudest triumphs. Tumors of enormous volume, and involving nearly the whole of the jaw, have been removed, again and again, successfully; and such undertakings may always be attempted the more cheerfully because of our positive conviction that there will be no repullulation.

8. *Hematoid Tumors.*—There is a peculiar tumor of the lower jaw, which, from the nature of its structure, deserves to be designated by the term hematoid, as most expressive of its true character. I have seen only one case of it, a brief history of which will afford a sufficiently accurate idea of its anatomy, symptoms, and progress. The patient, a man, aged thirty-five, had first noticed the affection about three years before I saw him. It had made its appearance in the form of a hard, solid tubercle, not larger than a hazelnut, on the left side of the jaw, just behind the cuspid tooth. Its progress was very slow for a long time, but at length it began to increase with considerable rapidity, and became the seat of a constant, dull, aching pain. At the time of my examination, the tumor extended from the middle of the large grinder on the left side to the lateral incisor on the right, bulging forwards in such a manner as to cause considerable deformity of the chin. The corresponding teeth inclined backwards and inwards, and were so loose as to be unfit for mastication. The gum was abnormally red, and somewhat hypertrophied, but otherwise perfectly sound. There was no enlargement of the neighboring lymphatic ganglions, and the general health was good.

The tumor was found, after removal, to be about the volume of a medium-sized orange, and to consist of a mere osseous shell, without any vestige of cancellated structure. It was occupied by three red, solid coagula, the largest of which did not exceed the volume of a pigeon's egg. The cavity was only partially filled by the clotted blood, which adhered to the inner surface of the bony wall, and exhibited distinct traces of organization. The man promptly recovered after the operation, and has ever since remained well.

9. *Encephaloid.*—The only form of carcinoma of the lower jaw worthy of notice is encephaloid. The malady may occur here, as elsewhere, at all periods of life, but it is much more frequent in childhood and adolescence than in middle age and decrepitude. Indeed, the very worst cases of it that I have ever witnessed took place before the tenth year, and ran their course with a rapidity truly frightful. Most of the subjects of the disease perish within the first twelve months from the commencement of the attack; and, if an attempt be made to relieve them by operation, however early, the disease is sure to return in a very short time, either at the cicatrice or in the adjacent structures, especially the lymphatic ganglions. As the symptoms, diagnosis, and prognosis of encephaloid of the lower jaw, do not differ, in any respect, from those of the upper jaw, any further account of it here would be useless.

10. *Deformity.*—A very unseemly deformity of the lower jaw is occasionally produced by an elongated condition of it; it is generally caused by the dragging exerted upon the bone by the vicious cicatrice of a burn, or by the pressure of some tumor, but instances occur in which it is congenital. The enlargement is generally, if not always, associated with a peculiar oblique or horizontal direction of the bone. Besides the disfigurement which it occasions, such a defect is necessarily attended with more or less inconvenience in mastication, and in the

retention of the saliva. For the cure of this deformity, an ingenious operation was devised by Dr. Hullihen, of Virginia, consisting in the excision of a V-shaped portion of the bone on each side; and in one case in which he performed it, the result was most gratifying, although the distortion had been unusually great.

11. *Anchylosis of the Jaw.*—This distressing affection, which may be produced in a variety of ways, may exist in such a degree as to render the patient entirely unable to open his mouth or to masticate his food. The most common cause, according to my observation, is profuse ptyalism, followed by gangrene of the cheeks, lips, and jaw, and the formation of a firm, dense, unyielding inodular tissue, by which the lower jaw is closely and tightly pressed against the upper. Such an occurrence used to be extremely frequent in our Southwestern States, during the prevalence of the calomel practice, as it was termed, but is now, fortunately, rapidly diminishing. Children, of a delicate, strumous constitution, worn out by the conjoint influence of mercury and scarlatina, measles, or typhoid fever, are its most common victims; but I have also seen many examples of it in adults and elderly subjects. In the worst cases, there is always extensive perforation of the cheeks, permitting a constant escape of the saliva, and inducing the most disgusting disfigurement.

Secondly, the affection may depend upon anchylosis of the temporo-maxillary joints, in consequence of injury, as a severe sprain or concussion, or arthritic inflammation, leading to a deposit of plastic matter, and the conversion of this substance into cellulo-fibrous, cartilaginous, or osseous tissue. I have met with quite a number of such cases: several in very young subjects.

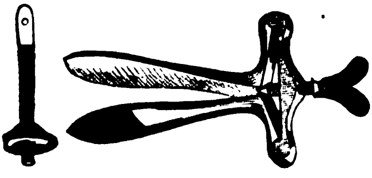
Thirdly, the immobility is occasionally produced by a kind of osseous bridge, extending from the lower to the upper jaw, or from the lower jaw to the temporal bone. Such an occurrence, however, is uncommon, and is chiefly met with in persons who have suffered from chronic articular arthritis.

Finally, immobility of the jaw may be caused by the pressure of a neighboring tumor, especially if it occupy the parotid region, so as to make a direct impression upon the temporo-maxillary joint.

However induced, the effect is not only inconvenient, seriously interfering with mastication and articulation, but is often followed, especially if it occur early in life, by a stunted development of the jaw, exhibiting itself in marked shortening of the chin, and an oblique direction of the front teeth. When complicated with perforation of the cheek and destruction of the lips, the patient has little or no control over his saliva, and is so horribly deformed as to render him an object at once of the deepest disgust and the warmest sympathy.

The *treatment* of this affection must depend upon the nature and situation of the exciting cause. When the difficulty is in the joint, occasioned by the formation of cellulo-fibrous bands, the only thing that can be done is to break up the adhesions, upon the same principle as in anchylosis of any other joint. For this purpose, the patient being thoroughly influenced by chloroform, the jaw is forcibly depressed, either by a wedge made of cedar wood, or by the instrument sketched in fig. 306, and depicted by Scultetus, in his well known work, the Armamentarium Chirurgicum, but reintroduced to the notice of the profession by Dr. Mott. It is constructed, as will be perceived, on the lever and screw principle, and may be employed with great advantage in all cases of anchylosis of the jaw, not only for breaking up the adhesions within the joint, but also for maintaining the separation afterwards. Owing to the remarkable tendency which the parts have to reunite, the instrument must be daily used for many months, if not for several years. Meanwhile, sorbefacient lotions should frequently be rubbed over the joints, and every precaution taken to keep down inflammation.

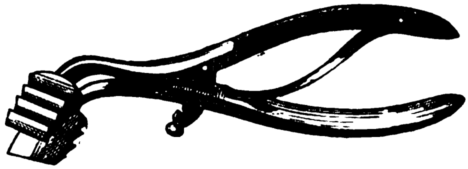
Fig. 306.



Scultetus's lever for separating the jaws.

The annexed sketch, fig. 307, exhibits an instrument, which, as a mere lever for separating the jaw, and breaking up morbid adhesions, is superior to that of Scultetus, which it closely resembles in its mode of action. It diffuses its pressure more widely and equably over the teeth, and is therefore less liable to fracture and dislocate them.

Fig. 307.

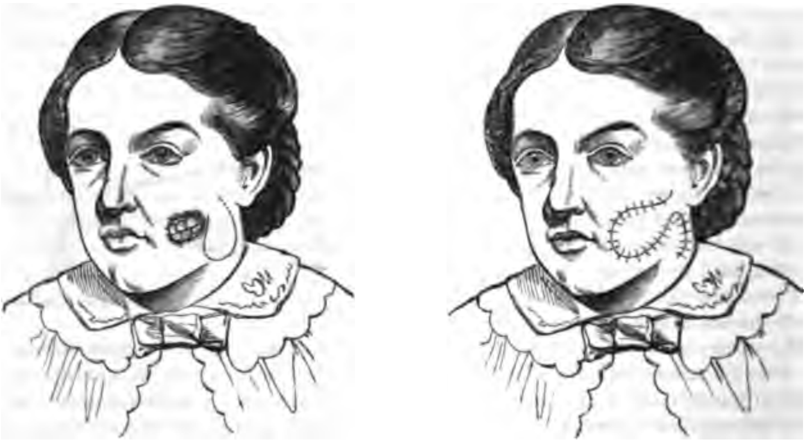


Lever for separating the jaw.

When the immobility depends upon the presence of inodular tissue, the proper remedy is excision of the offending substance, an operation which is both tedious, painful, and bloody, and, unfortunately, not often followed by any but the most transient relief, owing to the tendency in the parts to reproduce the adhesions, however carefully and thoroughly they may have been removed. There is the same remarkable disposition in these cases to the contraction and regeneration of the inodular tissue as in burns and scalds. During my residence in Kentucky, I had a large share of such cases, and, although I never failed to make the most thorough work, not unfrequently repeating the operation several times at intervals of a few months, very few of them were permanently relieved. After the excision is effected, the patient must make constant use of the wedge, wearing it for months and years, so as to counteract the tendency to re-closure. Any pieces of dead bone, and loose or ill-placed teeth that may be present, should always be removed prior to the operation upon the soft parts.

Immobility of the lower jaw, caused by the formation of an osseous bridge, connecting this piece with the upper jaw, may be remedied by the removal of the adventitious substance, by means of the saw and pliers. Sometimes, however, such a procedure is rendered inexpedient, on account of the long duration and excessive firmness of the anchylosis, and the large quantity of the new osseous tissue.

Fig. 308. Fig. 309.



Plastic operation on the cheek.

When the closure is of long standing, it occasionally becomes necessary to divide the masseter muscles, as they are often found, when this is the case, to be permanently contracted. The operation, performed, of course, subcutaneously, requires some care, lest important vessels should be divided.

The gap in the cheek, left by salivation, and so often accompanying closure of the jaw, may be filled up by a flap borrowed from the neighboring integuments, and carefully stitched in place. The adjoining sketches, figs. 308, 309, exhibit the manner of performing such an operation.

EXCISION OF THE LOWER JAW.

Excision of the lower jaw has become a frequent operation, and it is, therefore, very important that surgeons should have accurate ideas respecting the best mode of executing it. The bone may be removed entire, or it may be divided at its middle, and disarticulated at one joint, or, lastly, a considerable portion may be cut away at its centre, body, or ramus. The first attempt at amputation of the lower jaw was made by Dr. W. H. Deadrick, of Tennessee, in 1810, upon a lad fourteen years of age. The tumor was of a cartilaginous structure, and occupied the left side of the bone, filling nearly the whole of the mouth, and causing great difficulty in swallowing, and even, at times, in breathing. An incision was commenced under the zygomatic process, and carried across the tumor, in the direction of the jaw, to nearly an inch beyond the middle of the chin. From the centre of this, and, consequently, at a right angle with it, another incision was extended a short distance down the neck. The flaps thus marked off being separated from the morbid growth, the bone was sawed off just in front of the ramus and at the centre of the chin. The wound was united in the usual manner, and the boy, who made a speedy recovery, was found perfectly well thirteen years after the operation. In 1823, Dr. Mott excised nearly the whole of the inferior jaw on one side; and eighteen months after he removed all that portion of the bone included between the right temporo-maxillary joint and the bicuspid tooth on the left side. This, so far as I am aware, was the first case in which exarticulation of this bone was effected in the United States.

The operation is conducted upon the same general principles as excision of the upper jaw; the patient is placed in a similar position, and is brought fully under the influence of chloroform. The external incisions are made in such a manner as to avoid the unsightly appearance resulting from a large and exposed scar. For this purpose, when it is designed to remove one-half of the bone at its articulation, the knife should, as a general rule, be carried along its base, from the zygomatic process, about three-quarters of an inch in front of the ear, to the chin, and thence some distance up the median line, or even as high up as the red margin of the lip. When the tumor is of immense size, two incisions are sometimes required, so as to include an elliptical portion of the soft parts; but, unless this is the case, or the skin is seriously involved in the disease, not a particle of integument should be sacrificed; for during the healing process there is usually inordinate contraction, and hence, if this precaution is neglected, great deformity may be the consequence. By making the perpendicular incision in front of the ear, there will be little danger of wounding the temporal or external carotid artery and the trunk of the portio dura. Sometimes, as when the disarticulation is effected with difficulty, a short horizontal incision, just below the zygomatic process, will be advantageous; but, in general, this is unnecessary. The duct of Steno should always be avoided, as it readily may be by being careful not to carry the knife too high up, or too far forwards.

When the alveolar process alone is involved, it has been recommended that the base of the bone should be left intact, on the ground that it would serve to give support to the soft parts, and become the nucleus of a new deposit. It has even been insisted upon that, in such a case, extirpation could be easily and safely effected without any external incision, simply by detaching the lip or cheek from the jaw, and holding it out of the way during the division of the bone. Such a procedure cannot be too pointedly condemned; it does the work only half, and is sure to be speedily followed by a recurrence of the disease.

When the operation involves the removal of the jaw at the joint, the best plan is to expose the tumor as rapidly and carefully as possible, and then saw the bone at the anterior limits of the morbid mass. This greatly expedites not only the process of disarticulation, but the separation of the jaw from its muscular and mucous connections, as it enables the operator, by seizing its anterior extremity, to move the bone in any direction he pleases. Convenient saws for dividing the bone are represented in figs. 310 and 311.

ig. 310.

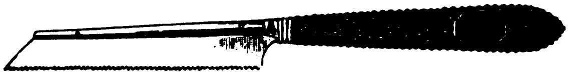
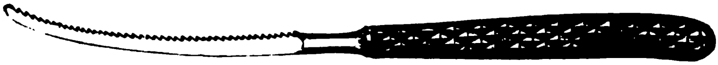


Fig. 311.



Saws for dividing the jaws.

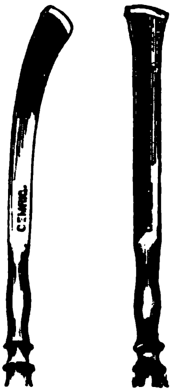
One of the most important circumstances to be observed in exsection of the lower jaw, is to keep in close contact with the morbid structure, and yet sufficiently away from it to prevent any portion of it from being left behind. By attention to this rule, which I regard as one of paramount importance, two great ends are attained, the easy removal of the tumor by a neat and rapid dissection, and the avoidance of hemorrhage. Cutting into the tumor is almost sure to be followed by the division of large vessels, which do not fail to bleed profusely, unless checked by compression until the operation is completed. Besides, chipping off a piece here and another there generally necessitates a tedious aftersection, alike painful to the patient, and annoying to the operator.

Another important rule, in these operations, is to work as much as possible with the handle instead of the edge and point of the knife, especially in detaching the bone from the soft structures. Whenever it can be done a portion of the periosteum should be saved, and there are few cases, except in the malignant forms of tumor, in which this membrane is so thoroughly involved in the disease as to render this impracticable. The part thus rescued is of great importance afterwards in filling up the void produced by the removal of the bone, at the same time that it prevents undue injury to the other soft structures.

One of the great difficulties connected with the excision of the lower jaw is the liberation of the coronoid and condyloid processes. The instrument which has always, heretofore, been employed for this purpose is the knife, or the knife and saw. The fibres of the temporal muscle, embracing the coronoid process on every side, are directed to be cut close to their attachments, or, instead of this, the process is sawn through at its base; the structures of the temporo-maxillary articulation are always divided with the extremity of the knife, entered at any point that may be most convenient. Now, it has always appeared to me that this mode of procedure should, if possible, be avoided, as it is apt to be followed by serious hemorrhage, and by injury of important nerves. This is especially the case with regard to the separation of the condyle, lying, as it does, in close and intimate relation with the internal maxillary artery, which must necessarily be endangered by the knife in this stage of the operation. A wound of this vessel, just as the operation is about to be finished, is an embarrassing circumstance, from the difficulty of applying a ligature, and is liable to be accompanied by copious hemorrhage. The coronoid process, although it projects up some distance into the zygomatic fossa, is separated with less difficulty, and, as it lies anterior to the maxillary artery, there is little danger of interfering with this vessel. Still, a pretty smart hemorrhage occasionally results from the division, simply, of the little arteries of the temporal muscle.

To obviate this danger, as well as to expedite the process of disarticulation, usually, and, in truth, very justly regarded, in the ordinary mode as no very easy part of the operation, I have used with great advantage an instrument combining the principles of a lever and a knife. The accompanying sketch, fig. 312, will convey a much better idea of it than the most elaborate description. The blade is slightly curved upon the flat, and is three inches and a quarter in length, by three-eighths of an inch in width; its thickness is about one line and a third. Its free extremity terminates in a convex edge, beveled off in front and behind, so as to admit of being used for dividing the periosteum, or scraping the bone, as may be deemed necessary. The other extremity is set in a stout, rough handle, nearly four inches long. A perfectly straight instrument of this kind, as seen in fig. 313, may be used with much advantage. The body and ramus of the jaw being detached from their connections, the semi-blunt edge of the elevator is insinuated beneath the fibrous covering of the coronoid process, and, after separating it for some distance, the bone is prized out. In the same manner the soft structures may be peeled from the condyle of the jaw, and the latter lifted from the glenoid cavity. The whole procedure is the work of a few seconds, and its great beauty, as was before stated, is its entire freedom from danger to the maxillary and other arteries, as well as the trunk and deep-seated branches of the portio dura. When these processes with their investing structures are perfectly sound, the separation must be effected, at least in part, with the knife, but even here the instrument above described will afford valuable aid.

Fig. 312. Fig. 313.



Elevators.

The gap left by this operation is often filled up, especially in young subjects, by a cartilaginous formation, of an irregularly cylindrical shape, which, while it serves to support the jaw in mastication, assists materially in re-establishing the symmetry of the features. The time required for the production of this substitute varies, in different cases, from a few months to several years. Even when one-half of the bone has been removed, nature sometimes succeeds most admirably in her object. In 1832, I had an opportunity of seeing an Irish lad, aged seventeen years, from whom Dr. Cusack, of Dublin, had extirpated, four years previously, the left half of the inferior maxilla, on account of a fibro-cartilaginous affection. In this instance, nature had made an attempt at reproduction, by means of a thick, rounded piece of cartilage, sufficiently strong to subserve the ordinary purposes of mastication, which was performed with the greatest facility.

SECT. III.—AFFECTIONS OF THE TEETH.

The diseases of the teeth are of too frequent occurrence, and too severe in their character, to justify their exclusion altogether from a work on surgery; it is true there are numerous monographs on dental science, but so there are on every other subject, and if we were to adopt the principle of omitting everything thus published, there would be very little left for the formation of a systematic treatise on any branch of the healing art. A knowledge of the affections of the teeth is of great importance to every physician, but it is particularly so to the country practitioner, who, in consequence of his remoteness from the regular dentist, is often obliged to extract teeth, and to give advice in regard to their diseases.

1. *Sympathies.*—The sympathetic relations of the teeth are adverted to in the first volume, in the chapter on Irritation. Their influence in inducing and maintaining ill health in the jaws, gums, eyes, ears, head, and lymphatic ganglions, as well as in other parts of the body, is displayed in a great variety of ways, and deserves the most careful consideration of the general practitioner. Without an intimate knowledge of their relations, he must remain ignorant of the pathology of some of the most common affections about the head and face, and be, consequently, unable to treat them upon correct scientific principles.

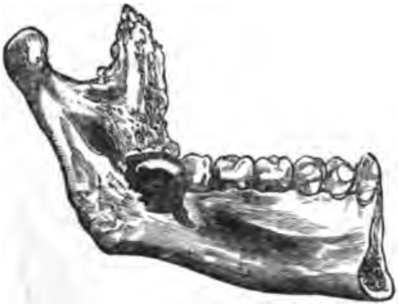
2. *Dentition.*—In children, during the progress of the first dentition, the sur-

geon is often called upon to relieve suffering on account of the pressure upon the gum by an advancing tooth, or, perhaps, more correctly speaking, the gum and the membranous cyst by which the tooth is surrounded. A great deal of irritation may thus be induced, which causes not only much local distress, but occasionally, also, much disturbance in the other organs, especially the brain, stomach, and bowels. In the more severe cases, the gum is red, tumid, and tender, the mouth is hot and dry, and the child is thirsty, feverish, and restless. Not unfrequently convulsions, coma, and death follow, from arachnitis, gastritis, or enteritis, or from a combination of these diseases.

The proper remedy for difficult dentition is free division of the gums and the inclosing membrane of the advancing tooth. The operation is usually performed with what is called the gum-lancet, but a far better instrument for this purpose is the blade of an ordinary pen-knife, the point of which, being very narrow and sharp, is thrust down in contact with the offending tooth, which is thus at once liberated from its confined position, much to the comfort both of the parts and of the system. The head of the little patient, during the operation, is held between the surgeon's knees, an assistant having charge of the rest of the body. In dividing the gum over the large grinders, a crucial incision is usually made, whereas a single one will always answer for the incisors. Very little bleeding follows the operation, generally just enough to relieve the engorged vessels; but now and then, as happened to me in one case, many years ago, it is so copious as to prove fatal, although such an event is not to be looked for unless there is a hemorrhagic diathesis. It has been objected to this operation that, when it is not followed by the immediate extrusion of the tooth, the cicatrice that will form over it by the healing of the gum will afterwards render its eruption more difficult; but such a conclusion is altogether erroneous, as all new tissues are much more easily destroyed than old or pre-existing.

Excessive suffering is often experienced during the evolution of the *wisdom tooth*, in consequence of its pressure upon the gums and neighboring structures, which are frequently too small for its comfortable accommodation. The result is that the parts become inflamed, swollen, ulcerated, and excessively painful, causing, at the same time, great trouble in mastication and deglutition, with a feverish state of the system. In the more formidable forms of the affection, there may be obstinate closure of the jaws, caries or necrosis of the coronoid process, abscesses of the neck, face, or tonsils, and ulceration of the cheek and tongue. Fig. 314 represents a specimen taken from a man who lost his life from this cause. The wisdom tooth projected forwards, and lay horizontally instead of perpendicularly. The patient was unable to open his mouth, the face was enormously swollen, and a large abscess occupied the neck as far down as the clavicle.

Fig. 314.



Vicious position of the wisdom tooth.

The remedy consists in a free division of the affected tissues, or, what is better, the prompt removal of the offending tooth, especially when there is not room enough for its full and rapid development, or when its direction is so vicious as to permit it to exert injurious pressure upon the tongue, cheek, or coronoid process. When the jaws are firmly closed, so as to prevent access to the tooth, means must be employed for their separation, as the interposition of gradually increasing wooden wedges, or the instrument depicted in fig. 307, the patient, in the latter case, being under the influence of chloroform.

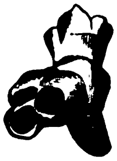
3. *Vicious Position.*—The front teeth, as they issue from their sockets, sometimes take a vicious direction, thus materially interfering with the good looks of the patient, if not also with the comfort of the mouth. The causes under the influence of which such an occurrence may happen, are, first, imperfect develop-

ment of the jaw, thereby crowding the teeth out of their proper position, and, secondly, the protracted retention of the first set, which thus arrest the progress of the second, as is so often witnessed in the superior maxillary bone of children.

The *treatment* must depend upon circumstances. When the jaw is manifestly too small for the advancing tooth, the best plan is to extract it, so as to afford more room for the development of its neighbors; otherwise, unless the malposition is very great and disfiguring, an attempt should be made, by means of pressure, to force the organ gradually into its natural situation. For this purpose, the patient should be instructed to push the tooth, with his fingers, several times daily towards the place which it is desired to occupy; or, if this fail, as it will be likely to do in cases of long standing, the rectification should be effected by keeping the tooth firmly tied to an adjoining one with a gum-elastic thread, a procedure which is often followed by the most gratifying results. When the old teeth are at fault, crowding the new out of place, they should be promptly extracted; when, sufficient room being afforded, the latter will generally soon assume their natural direction.

The malposition of the teeth is sometimes *congenital*, and then it is not always so easily remedied. Thus, in hare-lip and cleft-palate, the upper incisors are almost invariably badly formed, and thrust out of their natural situation. Instances also occur in which some of these organs are firmly united together by osseous matter; and Albinus has related a case where the crown of an eye-tooth was turned towards the maxillary sinus, the situation of the fang being reversed. A case precisely similar occurred in my practice, some years ago, in a young lady of twenty-three. The irritation which it caused in the jaw gave rise to a tumor requiring surgical interference.

Fig. 315.

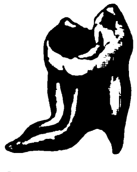


Fusion of the wisdom tooth and last grinder.

Fig. 315 represents the wisdom tooth of the upper jaw of the right side, inseparably fused with the fangs of the last grinder, the parts looking as if they had been ingrafted upon each other. The tooth was situated horizontally under the gum, by which it was nearly concealed; it was extracted from a woman, aged thirty years.

Cases occur in which the fangs of the teeth are very crooked, thus opposing a great obstacle to their extraction. Such a malformation is represented in fig. 316, where two of the roots are nearly horizontal. In a second series of cases all the roots are remarkably divergent; while in a third they are, perhaps, all soldered together by osseous matter. I have several specimens in my collection, in which the teeth are inseparably connected, in a similar manner, with the walls of their sockets.

Fig. 316.



Malformation of the fangs.

4. *Dislocation and Fracture.*—A tooth is sometimes dislocated, or lifted out of its socket, in consequence of external violence, as a kick, blow, or fall. Occasionally the accident takes place during an awkward attempt at extracting a diseased tooth. However induced, the proper remedy is immediate replacement of the organ, the socket having previously been cleared of blood, and retention being aided by accurate closure of the lower jaw by means of a bandage until the parts have become reunited. The adhesion, however, is generally imperfect, and it is seldom that the tooth afterwards subserves any very useful purpose, as it is very apt to remain sore and tender, and, ere long, to drop out.

The crown of a tooth, when broken, cannot reunite, but observation has shown that a fang may, the process being similar to that of a fractured bone, whose structure it closely resembles. The blood poured out at the moment of the accident being absorbed, lymph is effused, which thus becomes the basis of the new osseous substance.

5. *Ætal Changes.*—The teeth experience important changes as a result of age. As life advances they gradually lose their whiteness, and assume a peculiarly yellowish tint, which is often remarkably conspicuous in old people.

They become likewise more brittle, and the enamel exhibts an irregularly abraded appearance. These changes are produced by certain alterations which take place in the anatomical constitution of the teeth, from the obliteration of their vessels, and their consequently diminished supply of blood.

There is a singular affection of the teeth, described by dentists under the name of "the denuding process," the precise nature of which is still unexplained. It consists in the gradual removal of the enamel, generally without the slightest discoloration or diseased appearance. It is most frequently observed in the incisors, especially the inferior, but occasionally attacks the whole dental arch. As the denuding process advances, the crown of the tooth is slowly worn away, the enamel first disappearing at the top, and subsequently at the sides, until the greater part is removed. The organ, in the meanwhile, changes its color, gradually becoming more yellow, and finally, when the enamel is completely destroyed, assuming a brownish aspect. The most curious circumstance in the history of this lesion is the beautiful provision by which the cavity of the tooth is protected from exposure. This consists in a deposit of new bony matter, perfectly hard and solid, but so transparent that nothing but the closest examination can detect it. Thus a sort of permanent plug is formed, which effectually defends the delicate structure within, and which exactly resembles the transparent layers of an ægose pebble, surrounded by a more opaque mass. In what this lesion essentially consists it is not easy to determine, though it is not improbable that it depends upon some original or acquired defect of the enamel, whereby it is made to yield more readily to the mechanical attrition to which the teeth are constantly subjected. It is witnessed at nearly every period of life, but is by far most common in old people.

6. *Gangrene.*—Necrosis of the teeth is usually caused by external violence interrupting their vascular connections, the effects of mercury, or a syphilitic taint of the system. In scurvy, too, they often lose their vascular relations, and ultimately perish. When affected in this way, they assume a dull, yellowish, brownish, or blackish appearance, and finally drop out of their sockets. In most cases, the death is universal, not limited to particular parts of a tooth.

A necrosed tooth always acts as a foreign body, causing pain and inflammation in the surrounding soft parts, as well as absorption of the alveolar process. It is for this reason that it should always be promptly extracted.

7. *Caries.*—The most common, and generally also the most distressing, disease of the teeth is what is termed caries; an affection whose true nature appears to be still imperfectly understood, notwithstanding the numerous attempts that have been made to investigate it. Many pathologists, convinced that even the enamel, where the lesion always begins, possesses a sort of life-power, maintain that it is strictly analogous to ulceration of the osseous tissue; while others, equally respectable, assert that it is wholly dependent upon chemical action, effected by the acid secretions of the mouth, and they further insist upon it, as an additional proof of their position, that these secretions, like the caries itself, are almost exclusively met with in dyspeptic persons, or in individuals laboring habitually under disorder of the digestive apparatus. The arguments adduced by the advocates of this opinion are certainly very plausible; at the same time, however, it is so repugnant to our preconceived notions of the nature of morbid action generally that it is extremely difficult to adopt it. Perhaps it would be more philosophical to say that dental caries was the result partly of a vital, partly of a chemical process; or, what would probably be still nearer to the truth, that chemical action was the exciting, and molecular disintegration the immediate, cause of the disease.

Caries always begins in the enamel of the teeth, at some point of the crown, in the form of a minute, opaque, brownish speck, which gradually extends towards the centre of the organ, assuming at length a blackish color, and becoming so soft and brittle as to be crushed on the slightest touch. Thus a large cavity is exposed, whose existence perhaps had not previously been at all suspected. As it advances, the disease frequently destroys the entire crown, or converts it into a dark, pulverulent substance, without any trace of its primitive texture. The roots are usually the last to decay, and it often happens that they retain their vitality long after the other parts have completely perished. In this condition, however, they act as extraneous bodies, exciting ulceration of the gum and alveolar processes, whereby they lose their connection, and are finally dislodged. Figs. 317, 318, and 319 exhibit some of the more ordinary forms of this disease, from specimens in my collection.

Fig. 317.

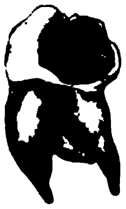


Fig. 318.

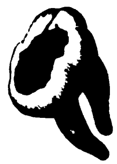
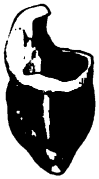


Fig. 319.



Different forms of caries of the teeth.

The teeth most liable to this disease are the last grinders, probably from some defect inherent in their constitution in consequence of their late development. The upper central incisors are also frequently affected, as are likewise the first molar teeth, particularly those of the under jaw. The lower incisors, on the contrary, are rarely attacked. Every part of the crown appears to be equally liable to caries; and it often happens that the disease begins simultaneously at several points.

Persons of a tubercular constitution are very subject to this species of decay, which often sets in at a very early period of life, and proceeds until nearly every tooth is destroyed by it. The upper incisors of children are frequently attacked in this way within a short time after their appearance, and occasionally, indeed, when they are still partially covered by the gum. There is sometimes an hereditary proclivity to this disorder, as is evinced by the fact that it often occurs in a considerable number of members of the same family, and in the children of parents who had been similarly affected.

Among the indirect causes of caries are, disorder of the digestive organs, the inordinate use of mercury, a syphilitic taint of the system, and, in short, whatever has a tendency to derange the general health. Among the local or direct causes are, accumulations of tartar upon the teeth, want of cleanliness of the mouth, and steady, persistent pressure of the teeth against each other.

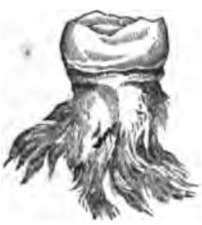
The effects of caries are pain in the teeth, and inflammation of the gums, jaws, and other structures. The pain may be very slight, or extremely violent; in general it is of a throbbing character, darting about in different directions, aggravated by recumbency, and attended with more or less soreness of the mouth and cheeks. Gum-boils are a frequent consequence of the disease.

The *treatment* must be regulated by the circumstances of the particular case. If the disease is extensive, the only proper remedy is extraction of the affected tooth, especially if it is attended with much suffering. If, on the contrary, it is slight, and the patient can bear the pain, the tooth should by all means be preserved, the cavity being excavated by appropriate instruments, the object being the removal of every particle of the affected structure, and the filling of the hole with gold leaf. When the operation is properly executed, the plug being firmly inserted, so that not a particle of air or fluid shall afterwards enter by the side of it, the tooth may be preserved for an indefinite period, without any impairment of its usefulness.

When there is a strong tendency to caries, much may be done in preserving the teeth, by way of attention to the general health and constant cleanliness of the mouth. The latter object is best attained by the daily use of a good, stiff brush, in the morning on getting up, and also after each meal, so that there shall be no chance whatever of the accumulation of tartar, food, alkali, or acid upon, around, or between, any of the teeth. The brush may be employed either alone with cool or tepid water, or, what is better, with a little soft toilet soap, prepared expressly for the purpose. When there is great tendency to the collection of calcareous matter, recourse must be had to some dentifrice, consisting mainly of prepared cinchona, chalk, orris root, and pumice stone, reduced to an impalpable powder.

8. *Inflammation of the Lining Membrane.*—The membrane lining the cavity of the teeth, generally considered as of a fibrous nature, occasionally takes on inflammation, the other anatomical elements being apparently in a sound state. The disease, if allowed to go on, almost always leads to the formation of an alveolar abscess. In other cases, there is a pretty abundant deposit of fibrin, both within the canal of the affected organ and around its roots, the latter exhibiting a singular shreddy aspect, the plastic, organized lymph hanging from the thickened periosteum in all directions, as in fig. 320. Occasionally, again, though this is not very common, purulent matter is poured out, forming an abscess analogous to what is sometimes observed in the interior of a bone. When the quantity of fluid is considerable, it is very apt, from its confined situation and consequent pressure, to produce mortification of the lining membrane, with absorption of the parietes of the cavity. By this means the pus gradually escapes at the extremity of the fang, the foramen of which is much enlarged. Ulcerative inflammation is next set up in the alveolar process and gum, which continues its ravages until the inclosed matter, now extremely offensive, obtains an outlet, the affected tooth meanwhile losing its vitality, and presenting a dull yellowish, dark, or brownish color.

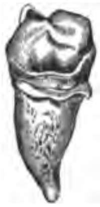
Fig. 320.



Fungous vegetations.

The exposure of the internal membrane from gangrene, fracture, or other causes, not unfrequently leads to the formation of *fungous tumors*, varying in volume between that of a pin-head and an ordinary pea, as seen in fig. 321. Of a pale reddish color, they are of a soft, fleshy consistence, and are essentially composed of a plexus of vessels, connected together by delicate cellular substance, and traversed by minute nervous filaments. From their excessive vascularity, these growths are liable to bleed upon the slightest touch ; and, although they are occasionally as insensible as healthy gum, yet in the majority of cases they are the seat of the most exquisite pain. The period required for their development varies from a few months to several years ; but from the great suffering which they induce, they are seldom permitted to remain for any length of time. They appear to arise, for the most part, from the lining membrane of the fang, from which they proceed more or less rapidly until they fill the whole cavity of the organ. Occasionally, there is reason to believe that they spring directly from the dental nerve, which becomes exceedingly vascular, elongated, and thickened, forming a species of neuroma. The teeth most frequently affected with this disease are the central incisors and the large grinders. Such a tumor is occasionally the seat of periodical hemorrhage, apparently vicarious of the menses.

Fig. 321.

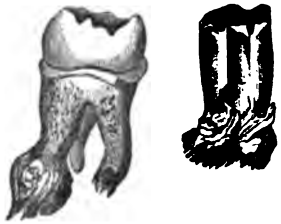


Fungous tumor.

9. *Dental Periostitis.*—The sockets of the teeth are invested by a fibrous membrane, which is reflected over the fangs and body of these organs, thus serving to maintain them in their proper position. The membrane, which is extremely vascular, is liable to inflammation and its several consequences, especially thickening and the formation of matter. The disease, anatomically considered, is characterized by deep congestion of the vessels, and by a softened, pulpy state of the membrane, and frequently terminates in suppuration and abscess. As the inflammation progresses the periosteum is detached at the most highly inflamed part, which is usually around the extremity of the fang, and the sac thus formed becomes the receptacle of the pus. The denuded portion of the tooth

loses its vitality, thereby adding to the irritation of the socket, which, in consequence, takes on ulcerative action, followed by a fistulous opening, and the escape of the accumulated fluid, beneath the gum, thus constituting what is called a gum-boil, parulis, or alveolar abscess. If the tooth be extracted after this occurrence, the sac will often come away in the form of a red, fungous mass, not unlike a small polyp. Fig. 322 and fig. 323 afford excellent illustrations of differents forms of the sac in alveolar abscess.

Fig. 322. Fig. 323.



Different forms of sac in alveolar abscess.

Dental periostitis sometimes occurs as an independent affection, but in most cases it is caused by the irritation of a decayed tooth, or by external violence. However induced, the pain is usually excessive, pulsatile, and accompanied with great swelling of the surrounding parts, especially of the face. Severe constitutional disturbance often attends, especially when matter is about to form. The fluid always points on the outside of the gum, as if nature were averse to making an opening in any other part of the alveolar process. To this rule, however, there is occasionally an important exception, the matter finding a vent at the roof of the mouth or at the posterior naris. Such an occurrence, which is always attended with great and protracted suffering, will be most likely to happen when the abscess has been occasioned by a number of diseased teeth.

The *treatment* is strictly antiphlogistic; by leeches and purgatives, followed by anodynes, diaphoretics, fomentations and poultices. The leeches may be applied directly to the inflamed gum. If matter forms, it must be promptly evacuated, otherwise it will not only keep up the pain, but may cause extensive destruction of the periosteum and bone.

10. *Dental Fistule.*—A dental fistule is always the result of a gum-boil, and often proves a source of much annoyance, as it is invariably connected with disease of an adjoining tooth and necrosis of the wall of its socket. The passage is generally short and narrow, frequently hardly admitting the finest probe. The orifice leading to it is usually indicated by a little reddish papilla, emitting, on pressure, a small drop of pus; in some cases it is temporarily closed, but reopens whenever there is an increase of matter. The most effectual remedy for this affection is the prompt removal of the offending tooth; this, however, is not always absolutely necessary, as the disease upon which the fistule depends occasionally disappears spontaneously, or under very simple treatment, especially a free incision and the use of astringent washes.

A dental fistule, instead of communicating with the mouth, occasionally opens upon the cheek, causing troublesome swelling and irritation, along with more or less discharge and disfigurement. The true nature of the affection may generally be readily determined by the use of the probe and by a careful inspection of the teeth, one or more of which will always be found to be diseased. A passage of this description is sometimes very large and devious. Its most common situation is at the base of the jaw, but it is occasionally met with on the cheek, in consequence of necrosis of the upper maxillary bone. Should the passage not close after the removal of the diseased structures, its edges should be freely excised, and then carefully approximated by suture, as in the common hare-lip operation.

11. *Exostosis.*—The teeth, especially the grinders, are liable to exostosis; a circumstance not surprising when it is recollected that, with the exception of the enamel, they are essentially composed of the same anatomical elements as the bones. The substance which is thus added differs from the pre-existing structure principally in being of a denser consistence, and of a yellowish, transparent aspect, not unlike chalcedony. The deposit ordinarily takes place at the root of the organ, but in some instances it affects the body, and it may even extend as high up as the crown. Analogy would lead to the inference that the new matter is furnished exclusively by the vessels of the periosteum; and this is,

doubtless, generally the fact. The progress of this disease is always tardy, a long time elapsing before the bony tumor acquires much bulk.

The symptoms of dental exostosis are too obscure to be of any diagnostic value. The pressure of the tumor upon the surrounding parts must necessarily cause more or less pain, which, however, it is impossible to distinguish from that of ordinary toothache. The only remedy is extraction of the offending organ.

12. *Formation and Accumulation of Tartar.*—The teeth, from want of cleanliness, as well as other causes, are very prone to become affected with earthy deposits. Originally, the substance possesses the character of a soft, friable, porous paste, which by degrees acquires the consistence of hardened mortar, and then often scales off in large masses, having the shape of the organ around which it was formed. Its usual color is a dull whitish yellow, though in some cases it is dark brown, blackish, or slightly greenish. It is principally composed of phosphate of lime, in association with mucus and a small quantity of animal and fatty matter.

The accumulation of this substance, vulgarly called *tartar*, often takes place with great rapidity, so that in a short time the dental arches are almost completely incrusted with it. Calculous, gouty, and dyspeptic persons are particularly liable to it; and it is also frequently witnessed during pregnancy and lactation. The deposit ordinarily begins around the necks of the teeth, just beneath the free margin of the gum. As it increases in quantity, it produces the most disastrous effects, exciting irritation in the soft parts, which, in its turn, leads to absorption of the gum and alveolar processes, until the teeth, deprived of their support, are loosened, and at length drop out.

It has been supposed that this matter is derived directly from the mucous secretions of the mouth, vitiated by chronic irritation; but the more plausible opinion is that it is exclusively furnished by the salivary glands, being held in solution by the fluid which it is the office of these organs to elaborate. This view of the subject is not only supported by the analogy which obtains in the formation of urinary calculi, but by the fact that this substance is always most abundantly deposited upon the superior grinders and the inferior incisors, teeth which lie in the immediate vicinity of the orifices of the salivary ducts; and also by the circumstance that it is composed of the same elements as the salivary secretion.

The *treatment* of tartar consists in its early removal by means of a brush and soft powder; or, if this is inadequate, by a suitable scaling instrument. If the matter is very firmly adherent, the operation must be performed with great care, otherwise there will be danger of loosening the teeth, as the point of the instrument is carried around their necks, between the gum and the concretion. Re-accumulation is prevented by diligent attention to cleanliness and to the general health.

13. *Toothache.*—This affection, technically known as odontalgia, is usually caused by caries of the teeth, leading to exposure of the nerve-pulp to the air, to the juices of the mouth, and to various kinds of extraneous matter. It may also be caused by inflammation and thickening of the dental periosteum, by necrosis of the teeth, exostosis, external injury, profuse salivation, and various morbid affections of the gums and jaws. There is a form of odontalgia which occurs in gouty, rheumatic subjects, apparently unconnected with any organic lesion whatever of the teeth. Occasionally, again, the disease is of a neuralgic character, coming on in violent paroxysms, which, however, seldom observe any regularity in regard to the period of their recurrence.

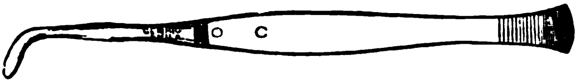
However induced, odontalgia is generally characterized by atrocious pains, of a throbbing, jumping nature, deep-seated, and, although most severe at the seat of the disease, darting with great violence along the branches of the fifth pair of nerves distributed to the affected jaw. In some cases, the pain is dull, aching, or gnawing. It is always aggravated by exposure to cold, by disorder of the general health, by cold and hot drinks, by acid, alkaline, and saccharine matter, and by recumbency. Hence, it is almost always worse at night after the patient retires to his bed, the throbbing commencing the moment the head touches the pillow. In the more severe forms of odontalgia, the pain extends to the ear along the nervous cord of the tympanum; and there is generally great soreness of the face, temple, and even the corresponding side of the head. Children, pregnant women, and dyspeptic persons are extremely prone to suffer from toothache from the most trivial circumstances.

The *treatment* of odontalgia must depend very much upon the nature of its exciting causes. When it has been induced by caries, and the decay has advanced so far as to render the preservation of the tooth a matter of impossibility, the only proper remedy is immediate extraction, before there is any serious inflammation of the gum and jaw. The same course is pursued when a tooth is necrosed, or the seat of exostosis; when there is chronic thickening of the dental periosteum, with the repeated formation of abscesses; or, finally, when the affected organ has measurably lost its connection with the alveolar process, whether from disease in the organ itself, or in the jaw. If, on the contrary, the decay is comparatively trifling, an attempt should be made to retain the tooth, and with this view the cavity should be gently filled with cotton, wet with a strong solution of morphia, aconite, and tannin, which often arrests the pain in a few minutes. If the suffering is very severe, the patient should at once take an active cathartic, especially when there is considerable derangement of the general health. The medicine may be followed, if necessary, by a full anodyne and diaphoretic. Should there be much swelling of the gums, a few leeches may be applied, or, if these cannot be had, the parts may be freely divided with the knife. Pain in the ear is best relieved by laudanum, and of the face by a hop poultice, or, what is better, an ammoniated liniment, strongly charged with morphia and tincture of aconite. When the pain is dependent upon malarious influences, quinine and arsenic will be proper; if upon a gouty or rheumatic diathesis, relief will probably be afforded by colchicum. If matter form, it must speedily be evacuated. The offending tooth should not be extracted so long as there is much inflammation. If the organ can be saved, it should be plugged as soon as it can bear the necessary manipulation. Of the numerous domestic remedies for odontalgia, there is not a solitary one deserving of any attention; most of them, in fact, are much more hurtful than beneficial.

14. *Extraction of Teeth.*—Extraction of the teeth may become necessary for various reasons, but more especially for the relief of pain consequent upon caries and necrosis of these organs, and on account of the irregularity of their position. In children, the operation is often required to make way for the permanent teeth. The deciduous teeth are always easy of extraction, owing to the partial absorption of their roots; the permanent, on the contrary, often demand great skill for their successful removal, especially when they are much decayed, when they are unusually brittle, or when their fangs are very firmly adherent, or widely separated. In the former case, they will be very apt to break off, while, in the latter, it is sometimes impossible to dislodge them without fracturing the alveolar process. There is generally a great-prejudice, even on the part of dentists, against the extraction of the deciduous teeth, on the supposition that it has a tendency to interfere with the development of the permanent set. I have been at much pains to inquire into this matter, and am satisfied that the idea is altogether erroneous; on the contrary, the operation, so far from being injurious, will generally be found to be eminently beneficial, not only relieving pain, but conducing to the beauty and perfection of the future organs.

The patient, during the operation, sits upon a chair or a low stool, as may be most convenient; if the surgeon stands behind, he himself, of course, supports the head, otherwise this function is performed by an assistant. The office of the dentist is always furnished with a high-backed chair, for the accommodation of the head. If chloroform is given, the patient must be partially recumbent, and it will be well not to carry the anæsthetic effect to complete unconsciousness, lest harm should result. Ether is, however, on the whole, more safe for the extraction of the teeth, and should, therefore, be preferred, especially as its administration does not require recumbency, or much care of any kind. If the patient is an adult, it will be proper, as a preliminary measure, to separate the gum carefully from the affected tooth, down to the very neck of the organ, with the twofold object of preventing laceration of the soft parts, and of facilitating the extraction; but in the child, no such precaution is ever required, as the connection between these structures is much less intimate than in the adult. The operation is readily performed with what is called the gum-lancet, represented in fig. 324.

Fig. 324.



Gum-lancet.

The *instruments* required for the extraction of the teeth are the forceps, key, elevator, and hook, the latter two being particularly useful in the removal of stumps, and of loose, deciduous teeth.

1. *Forceps.*—The forceps should be provided with short, stout blades, variously shaped, with a view to their easy adaptation to the different classes of teeth, as well as the same classes in the two jaws, and be rather sharp at the edges, that they may be readily passed down between the gum and the tooth, in close contact with the border of the alveolar process. The instrument should be large in the handle so as to afford a firm grasp for the hand. The annexed cuts, figs. 325, 326, 327, represent the different forms of forceps usually found in the dentist's case; but the ordinary operator will rarely require more than two, one straight, for the incisors and cuspids, the other curved, for the bicuspids and grinders.

Fig. 325.

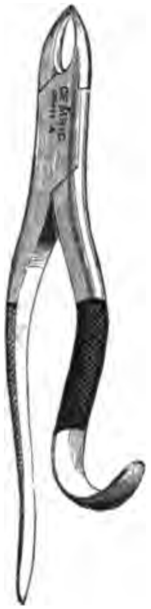


Fig. 326.

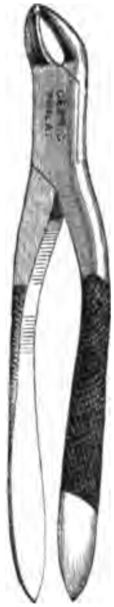
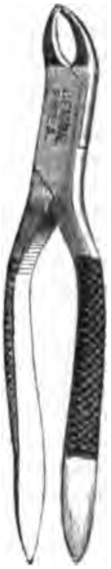


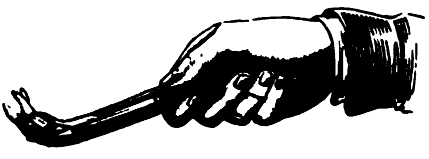
Fig. 327.



Different forms of tooth forceps.

The incisors, cuspids, and bicuspids are extracted on the principle of rotation and traction, the first movement being intended to separate the tooth from its connections, the second to lift it from its socket. Usually more force is required for the removal of the cuspids and bicuspids than for the dislodgement of the incisors. The rule is to apply the blades of the forceps as near as possible to the edge of the alveolar process, as seen in fig. 328. This procedure, which should not be deviated from in any case, is particularly necessary when the tooth is much decayed. The instrument should be held firmly in the hand, but no more force should be applied than is absolutely necessary to prevent it from slipping. If this precaution is neglected, there will be great danger of crushing the tooth, and so complicating the operation. In extracting a bicuspid, the organ should be loosened by pressing it several times outwards and inwards, as it is, in great measure, insusceptible of rotatory motion; as soon as it begins to yield, dislodgement is effected by elevating or depressing the hand, according as the tooth is a lower or an upper one.

Fig. 328.

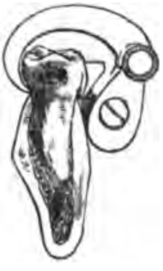


Mode of seizing a tooth.

Extraction of the molar teeth or grinders is effected on the same principle as that of the bicuspids; that is, the forceps are applied very firmly to the neck of the organ, which is then pressed several times outwards and inwards, until it feels decidedly loose, when it may readily be disengaged from its socket. The wisdom teeth, owing to the shortness of their roots, are always easily removed, comparatively little lateral motion and traction sufficing for the purpose. The most suitable instrument for the extraction of the lower wisdom teeth is the scissor-bladed forceps, now generally used by dentists.

2. *Key.*—The key is now seldom employed for the extraction of the teeth; it is an awkward, clumsy instrument, and often does great mischief, bruising and lacerating the gum, splintering the alveolar process, and inflicting severe pain. Moreover, unless particular care is taken in its application, the operation is very liable to be attended with fracture of the body of the tooth, leaving the fangs in their sockets, from which it will afterwards be extremely difficult, if not impossible, to dislodge them. The forceps, therefore, always deserve a decided preference. Nevertheless, there are circumstances which may render a resort to the key very proper, if not absolutely indispensable; especially when the teeth are unusually large, or very firmly imbedded in the jaw, and the operator does not possess the requisite strength for the efficient use of the forceps.

Fig. 329.

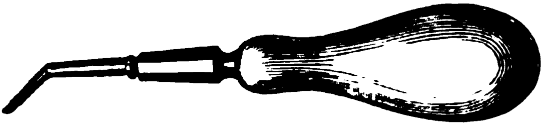


Application of the key.

The application of the key is conducted upon the same general principles as that of the forceps. The gum being well separated, the point of the instrument is pressed down between it and the neck of the tooth, which is then lifted perpendicularly, or nearly so, from its sockets, the whole procedure consisting in a forcible dislocation of the organ. If the key is too long, or applied too high up, it will almost inevitably break off the crown, or fracture the jaw. The proper position of the instrument is exhibited in fig. 329. To guard against mishaps, the surgeon should be provided with several keys, of different shapes and sizes, so as to adapt them to the exigencies of each particular case.

In operating upon the inferior bicuspids and the upper grinders, the fulcrum is applied to the inner surface of the jaw, and to the outer in operating upon the lower grinders, the wisdom teeth being always removed with the forceps.

Fig. 330.



Elevator.

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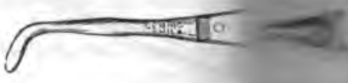

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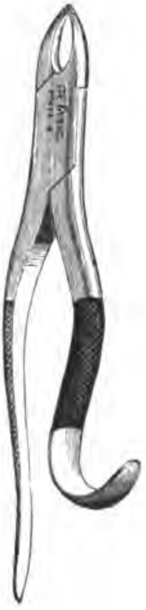

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symptoms are discoloration, with a soft and spongy state of the affected structures, more or less pain, and an increase of the mucous and salivary secretions. When the disease is severe or protracted, the teeth are apt to become loose, and the patient finds it difficult to masticate.

The *treatment* must be regulated by the nature of the exciting cause. Calculous deposits must be removed, the condition of the digestive organs rectified, and the general health improved. The milder cases will often get well spontaneously, or under the influence of a brisk cathartic and the use of an astringent mouthwash. When the inflammation has been occasioned by mercury, the most appropriate remedies are purgatives, strong lotions of acetate of lead and the liberal exhibition of chlorate of potassa, with leeches and warm poultices to the neck and jaws. In obstinate cases emetics of ipecacuanha will prove useful.

3. *Ulceration.*—One of the most frequent lesions of the gum is ulceration, produced by an accumulation of tartar around the necks of the teeth. The pressure that is thus exerted excites inflammatory action, leading to great thickening, sponginess, and discoloration of the gum, with erosion of its substance. In this way the teeth are entirely denuded at their necks, in consequence of which they often drop from their sockets, or become so loose as to be useless. The treatment consists in the removal of the offending tartar, and the use of medicated lotions, containing alum, tannin, and myrrh. The milder cases will generally rapidly yield under the application of powdered alum.

4. *Mortification.*—The gum, in common with the rest of the mucous membrane, is liable to mortification, from excessive mercurial action, the fumes of phosphorus, and probably also from causes which exert their influence chiefly through the constitution. Of this nature appears to be that variety of mortification which has been so ably described by the old writers under the name of "black canker," and by Dr. B. H. Coates, under that of the "gangrenous ulcer" of the mouth. Although it may begin at any part of the mucous membrane, yet, in by far the greater number of cases, it makes its appearance at the edges of the gum, over the neck of the central incisors of the lower jaw, in the form of a whitish, cineritious, or reddish ulcer, which varies in diameter from half a line to the eighth of an inch. In this state, the disease may continue for several weeks, if not months; but more commonly it extends its ravages, affecting either a large portion of the dental arches, or passing down in the direction of the sockets of the teeth, which, together with their periosteum and the alveolar processes, are gradually deprived of their vitality. The soft parts, in the meanwhile, assume a dirty, blackish appearance; and, on being detached, leave a ragged, sloughing ulcer, which is the seat of a foul, sanious discharge, of so excessively acrid a nature as to excoriate whatever texture it may touch. In this manner, the disease appears to be frequently propagated to the mucous membrane of the cheeks and lips, where it generally spreads with great rapidity, until the parts are completely perforated, or a black gangrenous spot manifests itself upon the external surface.

The true pathology of this disease is still involved in obscurity. It is almost wholly confined in its attacks to young, weakly subjects, and occasionally displays an endemic tendency. Thus, of 240 children observed by Dr. Coates in the Philadelphia Asylum, upwards of 70 were more or less affected with the primary ulcer at one time. In the early stage of the complaint there is little or no pain, the system is free from excitement, and the appetite and strength are scarcely at all impaired. When the sloughing process, however, has fairly commenced, the child suffers much local distress, and is harassed with constant fever. Dissection has thrown no light upon this singular variety of gangrene.

The *treatment* must be regulated by the nature of the exciting cause. Supporting measures, as quinine, iron, ammonia, and brandy, with a nutritious diet, are indispensable, and do more than anything else to arrest the spread of the disease. The most appropriate local remedies are lotions of acid nitrate of mercury, nitrate of silver, chloride of iron, and sulphate of copper, along with permanganate of potassa, for the purpose of allaying the excessive fetor If the disease extends to the cheeks, recourse may be had to the topical use of iodine.

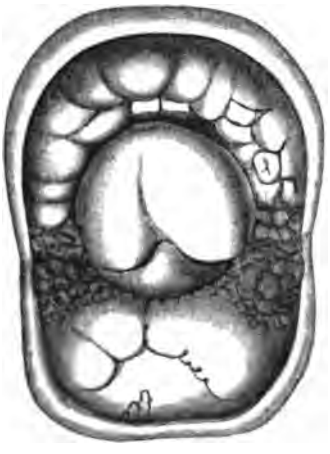
5. *Inflammatory Enlargement.*—Enormous enlargement of the gums is sometimes witnessed, especially in scurvy. When thus affected, they are of a red, livid, or purple appearance, and of a soft, spongy consistence, generally bleeding on the slightest touch, and forming two large ridges, in which the teeth, loose and discolored, are, at times, almost completely buried. The enlargement is of an inflammatory nature, and probably depends upon a depraved state of the system, produced by impoverished diet and other depressing influences.

The *treatment* is constitutional and local. Tonics, as quinine and the mineral acids, and nutritious diet, with brandy, wine, or porter, are generally required. When there is a marked scorbutic state of the system, subacid vegetables and drinks are indicated. The swollen gums should be frequently scarified, or even partially cut away, and touched once a day with a strong solution of nitric acid. In a remarkable case of this disease, under my charge, in 1851, more benefit was obtained from this application than from any other of the numerous articles that were tried, including creasote, copper, iron, myrrh, and alum. The teeth should not be extracted, unless they are hopelessly loose, as they generally regain their hold during convalescence. Any tartar that may incrust them should, of course, be carefully removed.

6. *Hypertrophy.*—The gums are subject to congenital hypertrophy, sometimes giving rise to remarkable deformity of the mouth and lips. The only case of the kind that I have ever seen came under my observation in a lad ten years old, remarkable for his stunted development, ill-shaped head, and large abdomen. The morbid growth affected the gums of both jaws, and was of a dense, fibroid structure. It first began to attract attention at the age of nine months, but there can be no doubt, from its history, that it had existed from birth.

The gum of the upper jaw formed a tumor of a pale color, inelastic, perfectly insensible, and of firm consistence, presenting very much the appearance of the snout of a hog. It stood off very obliquely, and received but a very partial covering from the corresponding lip. It was rough on the surface, and was about an inch and a quarter in its antero-posterior diameter, its width having been about one inch and a half. At its free margin, which was quite irregular, was seen the tip of the left central incisor. Extending back from this tumor, on each side of the whole length of the jaw, was the enlarged gum, forming a thick, broad ridge, completely imbedding the teeth. At several points, particularly behind, the morbid growth was more than nine lines in width; in front and at the middle it was less. It was of a more florid color than the main tumor, but of about the same degree of consistence. Opposite the bicuspid teeth, on each side, it exhibited a remarkably granulated appearance, the excrescences having a pediculated form, and being folded upon each other. Projecting towards the roof of the mouth, it greatly encroached upon this cavity, lessening its capacity, and thus interfering with its functions, as well as with speech and respiration.

Fig. 332.



Hypertrophy of the gums.

The lower gum was in the same condition as the upper, being equally hard and insensible, but less developed. It was of a bluish florid complexion, and larger in front and behind than at the intermediate points; its free surface was uneven, and so prominent as to hide all the teeth, except the central incisors, the point of the right cuspid, and the cusps of each deciduous and first permanent molars. This singular formation is well shown by the accompanying cut, fig. 332. The treatment consisted of thorough removal, by means of scalpels and scaling instruments. A good deal of blood was lost, and the operation, which had to be several times repeated, was necessarily tedious. Dr. J. N. M. Lynch, of Kentucky, who was kind enough to bring this patient to me four years ago, lately informed me that the gums have again commenced to grow, and that there is marked disease of the heart, with considerable enlargement of the tonsils, the arches of the palate, and the papillæ of the tongue.

7. *Cancroid Disease.*—The gums are liable to carcinoma, generally of a secondary character, being caused by an extension of the disease from the lower lip and jaw. I have now under my care a man, aged fifty, in whom it began in the sublingual glands. Occasionally, however, it originates in the gum itself. In what is called epulis, described in a preceding page, the morbid action probably always, or nearly always, takes its rise in the periosteum of the teeth.

TUMORS OF THE SPHENO-MAXILLARY FOSSA.

As a kind of appendix to the affections of the jaws, I may here briefly describe what are called tumors of the spheno-maxillary fossa, a subject lately discussed with much care by Professor Langenbeck, of Berlin.

These tumors may be of various kinds, as the fibroid, vascular, osseous, and encephaloid, all of which are capable of considerable bulk, and of penetrating, during their development, the base of the skull, and thus destroying life. Their diagnosis is, therefore, of the greatest importance, especially as they may be easily and safely removed in the earlier stages of their existence.

The precise point of origin of these morbid growths is variable; in general, they spring from the pterygoid process of the sphenoid bone, from the body of this bone, or from the superior maxillary bone. However this may be, they always advance, at first, in the direction of the least resistance, which is above and below the malar bone, where they, consequently, soon slightly elevate the cheek and temple. In time, they cover the whole exterior of the upper jaw, distend the temporal fossa, and penetrate the orbit through the spheno-maxillary fissure, pushing the ball of the eye upwards and somewhat forwards. They also gradually force their way through the spheno-palatine foramen into the posterior nares, driving the mucous membrane before them, and thus occasioning more or less obstruction of the nose. The facial portion of the morbid growth usually presents a remarkably constricted appearance, owing to the situation of the malar bone. The resistance of the pterygoid fascia effectually prevents the tumor from descending into the cervical region. Severe pain is generally experienced, especially when the mass is of large size, and, in that event, there is also great difficulty in opening the mouth.

The fibrous tumor of the spheno-maxillary fossa is characterized by its slow development and great firmness; the vascular, by its softness, by its deceptive sense of fluctuation, and by its marked diminution under pressure. The osseous tumor, besides being rare, grows very tardily, and seldom attains a large bulk. Its great feature is its excessive hardness. The encephaloid tumor is distinguished here, as everywhere else, by the rapidity of its formation, by its unequal consistence, and by the great volume which it is capable of attaining. Perforation of the cranium cannot be diagnosticated with certainty, inasmuch as it may occur without inducing any symptoms. Youth and middle age are the periods of life most obnoxious to these different morbid growths.

The extirpation of these tumors can only be effectually accomplished by the removal of the greater portion of the malar bone with the saw or pliers. The incisions through the integuments should be shaped in such a manner as that, while they afford free access to the morbid mass, they may not lead to any undue deformity. The temporal muscle must, of course, be divided, either partially or completely. The attachment of the growth is usually by a comparatively small pedicle. No serious embarrassment need be anticipated from hemorrhage, especially if the tumor is kept free from the knife.

CHAPTER XIII.

DISEASES AND INJURIES OF THE MOUTH AND THROAT.

SECT. I.—AFFECTIONS OF THE LIPS.

THE lips are liable to wounds, hypertrophy, encysted and vascular tumors, eversion of the mucous membrane, carcinoma, and congenital fissure.

1. *Wounds.*—Incised wounds of the lips, if treated with the twisted suture, readily unite by the adhesive process. To insure this, however, and also to prevent deformity from unseemly scars, the edges should be carefully cleansed, and approximated with the utmost accuracy. The bleeding may be considerable, but is effectually arrested by the twisted suture, which is always preferable in this situation, both on this account and on every other, to the interrupted. The ligature is just as improper here as in the operation for hare-lip. Lacerated, punctured, and gunshot wounds of the lips are treated on the same principles as incised.

2. *Carbuncular Inflammation.*—The lip is occasionally the seat of a species of carbuncle, and, if the case is misunderstood, or improperly treated, the results may be most disastrous to the beauty and symmetry of the features. The chief local remedy, of course, is free incision, made, if possible, on the side of the mucous surface, in order to avoid disfiguring scars. The application of iodine and suitable internal means will assist in preventing the spread of the disease.

In the New York Journal of Medicine and Surgery for May, 1854, Dr. Willard Parker has described what he calls a "Peculiar Form of Inflammation of the Lips and Face, resembling Malignant Pustule." In the three cases which illustrate his paper, the disease began in a pustule upon the lower lip, from which it gradually extended to the neighboring structures, as the cheeks, upper lip, nose, and neck, which soon became excessively hard, livid, painful, swollen, and finally gangrenous. The affection was characterized by unusual depression of the vital powers, and two of the cases speedily terminated fatally. The patients were young men, of temperate habits, and, at the time of the attack, in the enjoyment of good health, none having been exposed to any poisonous influence, either local or constitutional. From the symptoms which attended the disease, it is obvious that it bore a greater resemblance to carbuncle and malignant pustule, especially the latter, than to any other known affection.

3. *Ulcers.*—Ulcers of the lips are by no means infrequent, and they may be either common or specific. The former usually present themselves in the form of shallow fissures, cracks, or excoriations, as the result of disorder of the digestive apparatus, and readily yield to simple remedies, as blue mass, and a proper regulation of the diet, aided by mildly astringent lotions, Turner's cerate, or weak citrine ointment. In the more obstinate cases, active purgation, and the occasional application of the solid nitrate of silver, may be necessary.

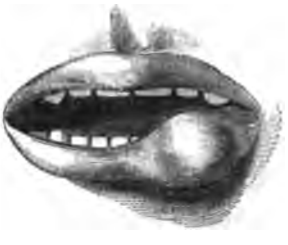
The *syphilitic* ulcer of the lips is generally the result of direct inoculation, presenting itself as a primary sore upon the labial border. Occasionally, the disease begins at the commissure, and it would appear that the upper lip is more prone to suffer than the lower. The chancre, commencing either in the form of a little vesicle or fissure, soon spreads, involving the entire thickness of the lip, which becomes hard, stiff, and painful. The discharge is thin and unhealthy, and signs of constitutional involvement at length manifest themselves, especially enlargement of the lymphatic ganglions at the chin and base of the jaw, and various cutaneous eruptions, as the papular and exanthematous. The treatment must be conducted upon the same principles as that of chancre upon the penis. If the ulcer is of a consecutive character, the proper internal remedy will be iodide of potassium with bichloride of mercury.

4. *Hypertrophy.*—Hypertrophy occurs almost exclusively in the upper lip, in young scrofulous subjects. I have seen it most frequently in females, but males are by no means exempt from it. The lip is hard, firm, rigid, and more than twice the natural thickness; the subcutaneous veins are unusually conspicuous; the skin is prone to ulceration; and the countenance has a singularly puffy and disfigured appearanee. The disease is often associated with eruptions of the scalp, psorophthalmia, enlargement of the tonsils, and other marks of the strumous diathesis, and may last for months and even years, before it is finally eradicated. The best diagnostic signs are the firm and rigid feel of the part, as ascertained by the thumb and finger, the obstinacy of the swelling, and the absence of disease of the gums and teeth, together with the peculiar state of the system just mentioned. Attention to the chylopoietic organs, the exhibition of iodide of iron, and the topical use of tincture of iodine, or a weak ointment of iodide of lead, constitute the the means which have succeeded best in my own hands. Occasionally, the cure is greatly expedited by the application of a few leeches. In obstinate cases, a mild course of mercury may be required. The operations which have been proposed, and occasionally performed, for the relief of this affection, are entirely unnecessary.

A very rare species of hypertrophy of the upper lip, apparently altogether unconnected with the strumous diathesis, is occasionally met with. It occurs chiefly, if not exclusively, in young subjects between the ages of eighteen and thirty, and, while it involves all the structures of the part, it depends mainly upon a great increase of the mucous follicles, and their connecting cellular tissue. The glands vary in size from a mustard seed to that of a swan shot, and are so closely aggregated as to form a distinct tumor on each side of the middle line, of a deep red color. The inner surface of the tumor is dotted with numerous orifices, which are nothing but the mouths of the enlarged follicles, and which are constantly bedewed with mucous fluid, which stands upon them in small drops. The fibrous structure of the skin is remarkably developed, and the lining membrane is not only thickened, but more or less chapped, ulcerated, or fissured. The lip, which has a hard, tough, leathery feel, is very prominent, and is greatly everted at its free border. Its external surface is generally natural. The affection is free from pain, but the part is stiff and devoid of feeling. The proper remedy is excision of an elliptical portion of the everted lip, including the enlarged glands, and approximation of the edges of the wound by the interrupted suture.

5. *Encysted Tumors.*—The encysted tumor is almost peculiar to the lower lip, on the inner surface of which it has its seat, as seen in fig. 333, from one of my patients. It is usually solitary, and depends essentially upon the obstruction of one of the glands which are found in such abundance in this situation. It is generally spherical in its shape, semi-pellucid, elastic, movable, and from the size of a cherry-stone to that of a hazelnut. Its walls are thin, but rather firm, and its cavity is occupied by a thick, glairy fluid, similar to the white of eggs. The ropiness of this fluid is sometimes remarkable, and cases occur in which it resembles the vitreous humor of the eye. The cystic tumor ordinarly forms without any assignable cause; its progress is slow, and it is seldom productive of much pain, the chief inconvenience which the patient suffers being a certain degree of stiffness of the lip. Sometimes it ulcerates and discharges its contents, when it is apt to become sore and tender. So far as I know, the first account of this disease was published in

Fig. 333.



Encysted tumor of the lower lip.

my Elements of Pathological Anatomy, in 1839. A similar but smaller tumor occasionally forms on the free margin of the upper lip.

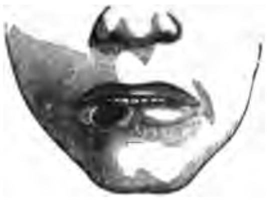
In the early stage of this affection a cure may occasionally be effected by the application of the tincture of iodine, especially if the tumor is previously punctured, so as to afford an opportunity for the escape of its contents; but, in general, the most certain remedy is incision with enucleation of the cyst, which, as I know from experience, is always easily accomplished with the forceps. In old cases, when the cyst has contracted firm adhesions to the surrounding structures, a portion of it may be cut away, and the remainder cauterized with nitrate of silver. Unless perfect removal is effected, reproduction of the disease may be anticipated. When the tumor is seated on the free margin of the lip, the preferable operation is excision, on account of the difficulty of enucleation.

6. *Vascular Tumors.*—Both lips, but more particularly the upper, are liable to vascular tumors, principally of the nature of congenital nevus. In one case, perhaps, there is a predominance of the arterial, in another of the venous, element, while in a third they are nearly equally balanced. When the arterial material abounds, the disease may possess all the characteristic features of aneurism by anastomosis, pulsating synchronously with the heart, and expanding under the influence of the passions. The morbid growth may be limited to the skin or mucous membrane, or, as is more commonly the case, involve all the tissues of the lip, forming sometimes a mass of considerable extent and bulk. It is easily distinguished by its history, its soft, erectile character, its scarlet or purple color, and its freedom from pain and malignancy. The proper remedy is ligation when the tumor is small and superficial; excision, when it is large and deep-seated.

7. *Cancer.*—It is a very singular and inexplicable fact that, while the upper lip is the exclusive seat of hare-lip, the lower lip suffers almost exclusively from carcinoma. This disease, which is peculiar to those of advanced years, occurs in both sexes, and may begin in a small, bluish, shot-like tumor, just beneath the mucous membrane, in a dark, warty excrescence, or in a small cleft, chap, or fissure. The probability is that it generally takes its rise in one of the mucous follicles, or in the submucous cellular tissue, from which it gradually extends to the other component elements of the lip, which often, in consequence, acquires an immense bulk. The part, at first, feels stiff and uncomfortable, it then becomes hard and rigid, and, finally, giving way at one or more points, it forms a large ulcerated mass, having a foul, bleeding, fungous appearance. The pain, from the start, is characteristic, being lancinating, pricking, aching, burning, or scalding, and darting about in various directions with great rapidity. The open surface is the seat of a sanious, fetid, and irritating discharge, and, at times, of considerable hemorrhage. As the malady advances, it gradually invades the gums, jaws, and neighboring lymphatic ganglions; the teeth become loose and finally drop from their sockets; the countenance exhibits a peculiar cadaverous aspect; the body progressively emaciates; and the poor patient is ultimately worn out by hectic irritation. The period at which death occurs ranges, on an average, from nine to eighteen months from the commencement of the malady.

The annexed sketch, fig. 334, shows this disease in its earlier stages, as a small, hard tubercle. Fig. 335, taken from one of my private cases, exhibits cancer of the lip in an open form, long after the occurrence of ulceration. The microscopical characters of the malady are displayed in fig. 336, from a drawing by Dr. Da Costa.

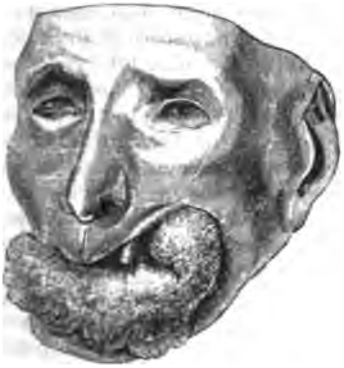
Fig. 334.



Epithelioma of the lower lip in its earlier stages.

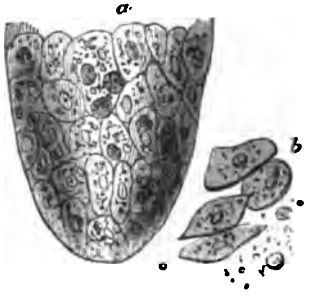
The *causes* of cancer of the lip are unknown. Writers and teachers who profess to be deeply versed in the etiology of the affection have gravely referred its origin to the habit of smoking with a short clay pipe, which, becoming heated, irritates the mucous structures, and thus lays the foundation of the disease. Such an opinion would be entitled to respect, if it were not for the fact that the subjects of cancer of the lip often do not use tobacco in any form whatever. While we are ignorant of the real cause of the disease, it is interesting to know that it is not always so fatal as carcinoma in other parts of the body. This circumstance is due to the fact that the malady is often of the epithelial kind, which, as was stated elsewhere, is generally much less malignant than true scirrhus, and, consequently, much more amenable to treatment.

Fig. 335.



Epithelial cancer of the lower lip, in an advanced stage.

Fig. 336.



a. Papilla taken from an epithelial cancer, magnified 250 diameters. b. Separate epithelial cells.

The only reliable remedy for this disease is *excision*, performed early and freely, while the local mischief is still, as it were, in its infancy. All other treatment here is as unavailing as in similar disease elsewhere, the only benefit which it can afford being palliation. When the tumor is superficial, and limited mainly to the prolabial surface, it may be removed by circumscribing it with an elliptical incision, as in fig. 337, the edges of which are afterwards neatly approximated by the uninterrupted suture; the parts heal by the first intention, and the cure is followed by hardly any deformity. When the involvement is more extensive, embracing the entire thickness of the lip, ablation is effected by two incisions, one on each side of the tumor, extending from the prolabial margin down towards the chin, where they meet at an acute angle, like the lines of the letter V, as in fig. 338. Provided the resulting chasm is not very great, the raw edges are placed in exact apposition, and retained by the twisted suture, as in the operation for hare-lip. The bleeding, which is sometimes considerable, is temporarily controlled by the finger of an assistant, and permanently by the contact of the abraded tissues. Occasionally it is necessary to cut away nearly the whole lip, and yet it is remarkable what little deformity is produced. In such cases, approximation is, of course, not sought for; the bleeding vessels are secured by ligature; and the gap is left to granulate, like a common suppurating wound.

Fig. 337.

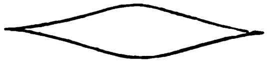
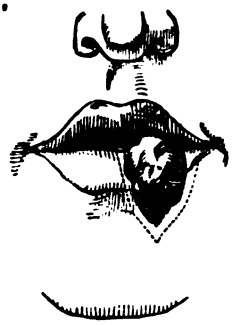


Fig. 338.



Epithelial cancer of the lip.

The period at which recurrence may be looked for after excision of this disease does not, in general, exceed five or six months. In a few instances I have known it to exceed several years. Hannover has related the case of a man in whom relapse did not occur for upwards of twelve years. He was operated upon, for the first time, in May, 1834, the disease having then already existed for two years. In 1846, the second excision was performed, the third in

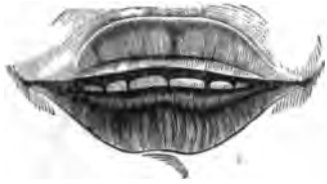
1849, and the fourth in 1850, with good results up to 1852. Similar cases have been reported by Cline, Lloyd, and other surgeons.

In 1846, I excised the central portion of the lower lip, embracing fully one-half of its extent, on account of cancer, for a gentleman, aged forty years. The tumor was about the size of a pigeon's egg, hard, firm, and the seat of sharp, lancinating pain. Six years after there was no return of the disease. In 1842, I assisted Dr. Dodson in extirpating the lip of a man fifty years old. The greater portion of the margin of the lip was indurated, and covered with a fungous growth, which had made its appearance seventeen months previously, in the form of a small wart. Ulceration at length set in; the pain was of a severe, burning, darting character, and the discharge was thin, sanious, and extremely fetid. The tumor was of scirrhous consistence, and the incisions included nearly the entire lip, from one commissure to the other. There was no lymphatic involvement. I saw this man nine years after the operation in perfect health. An eminent physician became affected with cancer of the lip in 1820. The disease continued to increase for six years, when it was destroyed by a powerful escharotic. Relapse occurring some time after, the affected parts were carefully excised, in 1830, by Professor Dudley, of Lexington. From that period there was no return of disease, and the gentleman finally died at an advanced age, upwards of twenty-five years after the operation.

The result of my observation is that the disease is most liable to relapse when it is of rapid development, especially in young and middle-aged subjects. Speedy repullulation may always be anticipated when operative interference is delayed until ulceration has set in, or until there is involvement of the neighboring structures. But even here there is an occasional exception, as in an instance reported by Dr. Stout, of Easton, in which there was no recurrence of disease at the end of three years, although the entire lower lip and more than half of the upper, along with the central portion of the lower jaw, had been removed. The worst cases for operation are those in which there is marked lymphatic involvement.

8. *Eversion of the Mucous Membrane.*—This affection is peculiar to the upper lip, and may exist either as a congenital vice, as a consequence of simple hypertrophy from the habit of biting the part, or as the result of a preternatural elongation of the labial frenum. However induced, it presents itself in the form of a narrow horizontal fold when the individual laughs, and gives the part the appearance of a double lip, as in fig. 339, from one of my patients. The deformity is remedied by removing an elliptical portion of the lining membrane, along with some of the glandular structure, and tacking together the edges of the wound with the interrupted suture. The operation is best done with the scissors. If the frenum alone is at fault, it should be duly abbreviated.

Fig. 339.

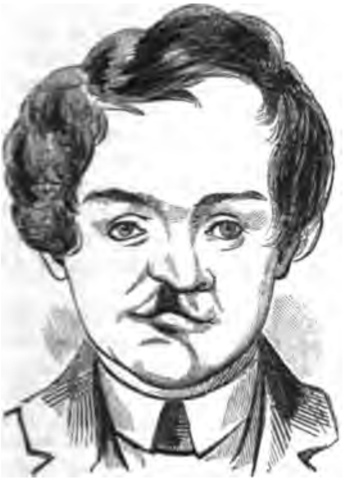


Double lip.

9. *Hare-Lip.*—Hare-lip is a congenital cleft, so termed on account of its supposed resemblance to the lip of the hare. It exhibits itself in several varieties of form, from the merest fissure to the most horrible and disgusting chasm. It may be single or double, simple or complicated. The relative frequency of these different varieties is not determined; but it is certain that they are sufficiently common, and they should, therefore, be studied with great attention. The upper lip alone is their seat, and they affect the left side much oftener than the right. A mesial fissure is extremely rare, and probably never occurs without being accompanied by a lateral one.

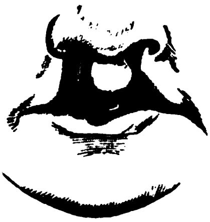
In the most simple form of the defect, there is merely a fissure in the lip, extending from its inferior border as far up as the gum; its edges, of which the outer is always more or less oblique, are rounded off, covered by mucous membrane, and of a florid red color. Their consistence is considerably greater than that of the other labial structures, and, on being held together, they are seen to form, by their divergence below, a sort of triangle, the base of which corresponds with the free margin of the lip. In another class of cases the cleft is not only wider, but extends considerably higher up, perhaps even into the nose, which, in consequence, is usually somewhat flattened at the side, as seen in fig. 340, from a clinical case. The jaw in this, as in the former variety, is entirely normal.

Fig. 340.



Single hare-lip.

Fig. 341.



Double hare-lip.

In double hare-lip, fig. 341, there are, as the name implies, two fissures, with an intermediate central piece, which varies much in size, shape, and direction, being sometimes broad and quadrangular, but more generally narrow, elongated, or mammillated. The framework of this part consists of two distinct portions, corresponding with the incisive bones of the inferior animals, and forming a rounded knob, connected by a narrow neck to the nasal septum. It is commonly very oblique, sometimes, indeed, almost horizontal in its direction, is often very imperfectly covered by skin, contains the rudiments of the central incisor teeth, and almost invariably coexists with cleft palate and deformity of the nose. The fissures bounding this knob are not always of the same size and shape; on the contrary, one is frequently much wider, as well as longer and more curved, than the other. They may both extend into the nose, or one may do so, and the other, perhaps, not reach higher up than the gum. Figs. 342 and 343 represent the more common forms of the septum.

Fig. 342.

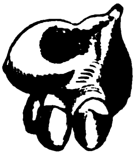
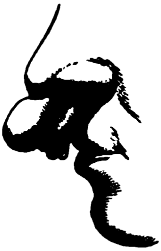


Fig. 343.



Deformity of the jaw in hare-lip.

The *complications* of hare-lip are various, and deserving of attention. One of the most simple is that in which the labial fissure is blended with a depression, prominence, or cleft in the alveolar process of the jaw-bone. The cleft may be partial or complete; in the latter case, it is generally, if not always, connected with flattening and deformity of the corresponding side of the nose, and, not unfrequently, also with fissure of the palate. In double hare-lip, the openings in the soft structures are almost always associated with malformation of the roof of the mouth. They pass round the central knob, at the posterior surface of which they become continuous with the palatine fissure, which generally extends both through the hard and soft parts as far as the extremity of the uvula.

Hare-lip is sometimes associated with other congenital malformations. I have witnessed its coexistence with club-foot, bifid spine, and scrotal hernia, and lately I saw an instance where, along with a horrible cleft in the palate, there was great deformity of the hands, one of which was deprived of three fingers, and the other of one finger and the thumb.

Mr. Fergusson has described a very singular case of hare-lip in an infant, in whom a fissure on the left side of the upper lip, resembling that usually called hare-lip, coexisted with a fissure on the right side, extending from the angle of the mouth upwards and outwards, as far as the malar bone, without communicating with the nostril. The track was lined by mucous membrane, and there was a slight depression in the anterior wall of the antrum. The disfigurement was greatly increased by the defective condition of the left lower lid, which looked as if it had been torn and tacked to the eyeball.

Of the *cause* of hare-lip we are entirely ignorant. That it is the result of an arrest of development is certain; but how this arrest is produced has not been satisfactorily explained. I am not aware that any statistics exist in regard to the relative frequency of the affection in the two sexes. In my own practice I have seen it nearly as often in one as in the other.

Hare-lip occasionally occurs in several members of the same family; and a case has been communicated to me by Dr. R. A. Lightfoot, of Kentucky, in which this malformation has shown itself in four successive generations, mostly in its double form.

Hare-lip, besides being very unseemly, and, consequently, an object of constant attention and remark on the part of others, interferes materially with sucking, deglutition, and articulation. In the worst grades of the affection, as when the fissure is double, or associated with cleft-palate, it is often extremely difficult for the child to obtain the requisite amount of nourishment, much, if not most, of what is attempted to be swallowed regurgitating by the mouth. As he grows up, he finds himself unable to pronounce labial sounds, and thus, unless the defect is early remedied, his education must necessarily suffer, if, indeed, it be not entirely neglected.

The malformation under consideration can only be relieved by *operation;* and the question, consequently, arises at what period should it be performed, whether, almost immediately after birth, within the first few months, or not until the child has attained the age of two or three years? There are few subjects in surgery which have been more frequently or more thoroughly discussed than this during the last quarter of a century. I am not certain, however, that the numerous controversies that have grown out of it have been of much benefit in settling the point; for my opinion is that, practically considered, surgeons are governed, in this matter, more by the results of their own experience than by the writings of their professional brethren. As in most other cases, so in this, the probability is that a middle course is the safest; at all events, it is the one which I have myself commonly pursued, and thus far I have seen no reason to regret it. My conviction has long been that the most eligible period is from the third to the sixth month, or a short time before the appearance of the first teeth; the operation is then usually borne well, there is no danger of convulsions, and the adhesive process generally proceeds most kindly. In very simple cases, I do not hesitate to attempt it earlier; and, on the other hand, in double, or very complicated hare-lip, I almost always postpone it until the child has attained its second or third year. The operation in this variety of hare-lip is a very serious one; there must always necessarily be more or less loss of blood; the shock is frequently severe; and the resulting inflammation may be over-active; valid reasons, I conceive, for the exercise of caution and judgment. In the few cases in which I have performed the operation under such circumstances, the issue has been anything else than gratifying. It need hardly be added that, in an undertaking of so much importance as this confessedly is, it is of vast consequence that the general health should be as good as possible; a feeble, irritable, or anemic state of the system is little favorable to the adhesive process.

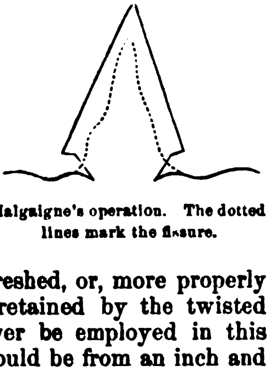
The operation being determined upon, the child is wrapped up in a strong apron, in order to render it as passive and helpless as possible while its different stages are gone through with. If he is very young, he is placed upon the knees of an assistant, the head being nearly perpendicular, and held firmly by another assistant standing behind. Secured in this manner, he will not be likely to suffer any inconvenience from the bleeding, as the blood will not be so apt to flow into the throat. If he is very unruly, he may be put partially under the influence of chloroform, but the full effect of the medicine is never necessary.

The operation, as it is usually performed, may be divided into three stages. In the first, the lip is extensively detached from the gums, sometimes as high up even as the nose, especially in bad cases. This I regard as a step of the greatest importance in regard to the form and beauty of the new lip, for so, in truth, it may be called. The second stage consists in paring the edges of the fissure, and the third in approximating them with the twisted suture. The instruments required are a narrow, sharp-pointed scalpel, a pair of scissors, forceps, a sponge-mop, and a few small pins with glass heads.

Everything being arranged, and the child firmly secured, the lip is carefully dissected off the gums, after which the edges of the fissure are pared with the same instrument, or, what will usually answer equally well, a pair of scissors. If the knife is used, it is inserted at the upper angle of the cleft and brought out at the lower, the surgeon cutting towards himself. In executing this part of the operation, the serious error is frequently committed of removing too little substance, in consequence of which, when the edges are approximated, there is an unsightly notch at the prolabial surface of the wound, which nothing short of another operation can efface. My invariable practice is to cut away the whole of the rounded portion of the fissure, and also, whenever there is a sufficiency of substance, to impart to the incisions a slightly curvilinear direction, so that the notch alluded to shall be effectually prevented, and the lip receive its proper length.

Malgaigne, with a view of preventing the prolabial notch, which is so apt to follow the ordinary operation, especially when carelessly done, has proposed to pare the edges of the fissure in such a manner as to leave two angular flaps below, which, when brought together, shall effectually obviate the defect. The procedure will be readily understood by reference to fig. 344. If, when the parts are healed, the flaps should be found to be redundant, they can easily be retrenched with the knife or scissors. Professor March, of Albany, accomplishes the same object by means of a pair of forceps, each blade of which terminates in a transverse jaw, convex at its free extremity, and serrated within, so as to secure a better hold upon the lip.

Fig. 344.

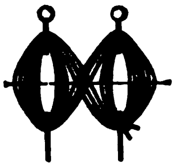


Malgaigne's operation. The dotted lines mark the fissure.

The hemorrhage attendant upon the paring of the edges of the cleft is easily controlled by the thumb and finger of an assistant, or by pressure upon the facial artery as it passes over the body of the lower jaw. If any blood falls into the mouth, it is at once removed with the finger, or a suitable sponge-mop.

The edges of the fissure having been thoroughly refreshed, or, more properly speaking, excised, are accurately approximated, and retained by the twisted suture, the only one which, in my judgment, should ever be employed in this operation. Three pins are generally required; they should be from an inch and a quarter to an inch and a half in length, according to the width of the gap, strong and well tempered, yet delicate, very sharp, and provided each with a glass head. The first instrument is inserted on a level with the red border of the lip, about three lines from the raw surface, and is brought out at a corresponding point on the opposite side, at least two-thirds of the thickness of the lip being in front of it. A strong silk thread, properly waxed, is then wrapped round the pin, not in the form of a figure 8, as is usually recommended, but elliptically, as in fig. 345, and neither so firmly, on the one hand, as to create undue tension, nor so loosely, on the other, as to prevent perfect apposition. Another pin is passed, in the same manner, through the middle of the wound, and, finally, a third near its upper extremity, just below the nose. Sometimes two pins are quite sufficient, while, at other times, as many as four may be required. The pins having all been wrapped, the ends of the threads may be

Fig. 345.



Hare-lip suture.

passed from one to the other across the interstices, being thus made to subserve the purpose of adhesive strips. All that now remains to be done is to cut off the point of each instrument with a pair of pliers, lest they should become entangled in the pillow, or the little patient hurt his hands. In performing this apparently trivial part of the operation, the surgeon makes moderately firm pressure upon the centre of each pin, otherwise it may, if not well tempered, break in the substance of the lip, and thus necessitate the introduction of another.

Some surgeons give the preference, in performing this operation, to the common interrupted suture, and there is no doubt that a good cure may be effected in this way, especially if the treatment is aided by a few narrow adhesive strips. I must say, however, that, after long experience, I consider the operation above described as altogether superior.

No *dressing* is required after the operation. The part is kept cool and quiet, to insure adhesive action; and the child is fed with the spoon, the most suitable diet being milk, arrowroot, or chicken broth with soft-boiled rice. The upper and middle pins are withdrawn at the end of the second day, the lower one being left in twenty-four hours longer. The threads, which soon become permanently glued to the lip by plastic matter, are permitted to drop off spontaneously, as they often perform excellent service in maintaining apposition after the more efficient means have been removed. If any portion of the wound remains open, it is touched lightly with a pencil of nitrate of silver; or, if the gap is considerable, apposition is effected by the twisted suture, as in the first instance. If the chasm is very large, additional support is furnished by carrying a long and rather stout pin completely through the lip, at the distance of at least half an inch from each edge of the wound. Such a proceeding will be found to be much more efficacious than the use of an adhesive strip, stretched from one cheek to the other.

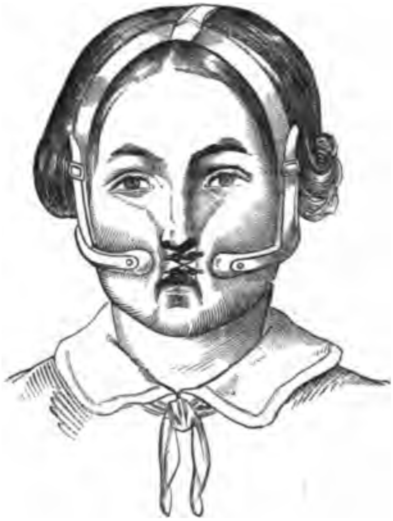
The operation for *double hare-lip*, although conducted upon the same principles as that for single, must necessarily vary according to the nature of the concomitant deformity. If the intervening piece is vertical, or nearly so, completely covered by skin, and of proper length, all that is required is to close the fissures in the usual manner; not generally, however, at one time, but after an interval of several weeks, unless the child is uncommonly strong and well developed, otherwise the shock and loss of blood will be likely to interfere with the adhesion. If, on the contrary, it is very oblique, or almost horizontal, an attempt should be made to rectify it by separating it carefully from the nose, and then pressing it back with a pair of stout forceps, or, as I ordinarily do, with the fingers, having previously incised it with a strong knife. The part is kept in place by means of a narrow strip of adhesive plaster, renewed from time to time; and after it is thoroughly healed, its edges are pared and approximated in the usual manner. The division of the septum is generally attended with considerable bleeding, which should of course be promptly checked.

When the intermaxillary septum is excessively deformed, it should be excised either with the bone-nippers, a strong scalpel, or a small saw. Smart hemorrhage, from the division of the artery of the nasal septum, usually attends the operation, but, in general, soon ceases spontaneously, or with the aid of a little pressure with the finger. Should it prove troublesome, it may be necessary to touch the bleeding orifice with a heated probe, or to apply a graduated compress and roller. In the latter case, the paring of the edges of the now large and single cleft must be postponed until the child has recovered from the effects of the operation. Removal of the intermaxillary septum in double hare-lip is not unattended with danger. I have heard of at least one instance in which it occasioned death.

It has been proposed, in double hare-lip, to rectify the vicious position of the central piece by systematic compression, made either with the finger or a spring-truss, not unlike the instrument used in the treatment of umbilical hernia. In my own practice, however, I have seen no benefit from the proceeding, and I believe that it will generally be found inapplicable, or wholly inefficient. In removing this structure, great care should be taken not to encroach too much upon the nasal septum, otherwise the lip will be certain to have a flat and depressed appearance. Indeed, it is a good plan, in most cases, to retain a portion of it, for the purpose of supporting the soft parts; and this may always be easily enough done if the bone is divided perpendicularly through the alveolar process, the teeth, if any protrude, having previously been extracted. When the patient has reached the proper age, the piece thus retained can readily be retrenched, and the chasm filled with an artificial jaw. Another circumstance, not to be neglected where removal of the intermediate body is demanded, is to save a portion of its cutaneous covering; this should be properly shaped, and fastened, at the close of the operation, by several short, delicate needles, to the nasal septum, which it thus serves to render more prominent and seemly.

When the chasm is uncommonly large, as often happens when the intervening substance is removed, the tension of the parts may be so great as to require support. The most suitable contrivance for this purpose will be found to be that sketched in fig. 346. It was devised by Mr. Hainsby, and is so arranged as to press each cheek over towards the middle line.

Fig. 346.



Hainsby's cheek compressor.

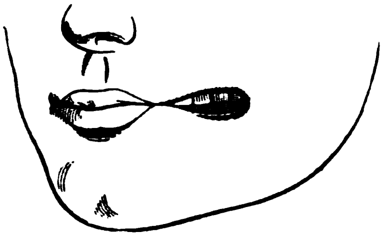
When the malformation is associated with a cleft in the alveolar process of the jaw, an attempt should be made to obliterate the latter, provided it is not very large, before we operate for the cure of the former. This may often be very satisfactorily accomplished, especially if the treatment is commenced within a few days after birth, by the plan originally suggested by Dr. Hullihen. It simply consists in the application of several layers of adhesive strips to each cheek, the inner ends of which extend across the lip beneath the nose, where they are drawn together by ligatures, daily tightened until the opposite edges are brought into contact. The dressing, which need not be renewed oftener that once a week, does not interfere with sucking, and usually effects its object in from one to two months.

When this treatment succeeds, Dr. Fundenberg, of Maryland, advises that the borders of the cleft should be carefully pared, and approximated by a strong ligature, passed through each side of the jaw, one-third of an inch from the edge of the fissure, and tied as firmly as possible while the two bones are pressed forcibly together by an assistant. The suture is retained for eight or ten days, the cheeks being supported in the interval by adhesive strips, arranged as already indicated. This mode of treatment is highly ingenious, and deserving of a fair trial. It is, of course, to be resorted to only in very young children, before the osseous tissue has acquired much solidity.

I had occasion, in 1849, to see a very singular, and, so far as I know, unique case of hare-lip. The patient was a stout, healthy boy, four years of age. The cleft, which was congenital, occupied the left side of the cheek and the corresponding commissure of the mouth, being about one inch in length, by three-quarters of an inch in breadth. Its edges were rounded off, hard, red, and covered with mucous membrane, as in ordinary hare-lip. The child was unable to articulate distinctly, and experienced much difficulty in controlling his saliva, food, and drink. The parts, pared in the usual manner, were approximated by three points of the twisted suture, and united beautifully by the first intention. The improvement of the face was most satisfactory. The annexed sketch, fig. 347, gives an accurate idea of the face prior to the operation.

10. *Lower Lip.*—It is extremely rare to meet with malformations of the lower

Fig. 347.



Fissure of the cheek.

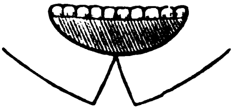
lip. I have myself never seen a case of congenital fissure here, and, with the exception of that of Nicati, I do not know that there is one on record. In this instance the cleft seems to have been mesial.

A very curious malformation of the inferior lip, in the form of two little sacs, one on each side of the middle line, was described by Dr. Jardine Murray, in 1860. It occurred in four members of the same family, in three of which it was associated with hare-lip. The pouches, which occupied the margin of the lip, were half an inch in depth, of a crescentic shape, moistened with glairy mucus, and capable each of receiving a split pea. The proper remedy for such a defect, which, probably, essentially consists in a malformation of a muciparous gland, is thorough excision.

11. *Cheiloplasty.*—Extensive destruction of the lips sometimes occurs; generally as a result of malignant disease, accident, or sloughing from inordinate mercurialization, carbuncular inflammation, and other affections. The deficiency thus occasioned may generally be efficiently closed by an autoplastic operation, performed upon the same principle as in making a new nose, the integumental flap being borrowed from the immediate neighborhood of the gap. When the upper lip is affected, the flap is generally taken from the cheek, or partly from the cheek and partly from the neck. A similar procedure may be adopted when the outer portion of the lower lip is to be repaired, whereas, when the deficiency exists at its middle, the skin should be taken from the chin, the incisions, if need be, being carried as low down as the hyoid bone.

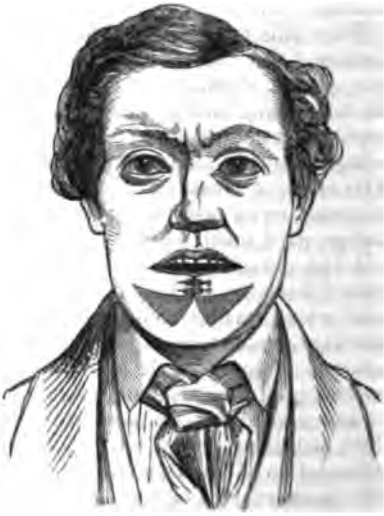
After removal of the lip on account of cancerous disease, an excellent substitute may generally be made by raising two quadrilateral flaps from the lower part of the face and the upper part of the neck, by carrying an incision on each side obliquely downwards, beneath the jaw, from the base of the gap, and then obliquely upwards and backwards, some distance beyond the commissure of the lip. A triangular piece of skin is thus left at the middle line, the apex of which is directed upwards, and serves to mark the point of junction of the two flaps, after they have been dissected up, and stitched in place. The adjoining fig. 348 affords a good idea of the lines of incision, while fig. 349 exhibits the appearance of the parts after they have been united. The operation, which I have successfully performed in several instances, is usually known as that of Mr. Syme.

Fig. 348.



Lines of incision in cheiloplasty.

Fig. 349.



Cheiloplasty.

12. *Contraction of the Mouth.*—This defect is sometimes congenital, but much more frequently a result of disease, particularly of profuse and destructive ptyalism. The contraction may amount almost to complete closure. However induced, it is both unseemly and inconvenient. In regard to the treatment of

such a condition, no special rules can be laid down; the skill of the surgeon will generally indicate the course to be pursued in each particular case.

SECT. II.—AFFECTIONS OF THE TONGUE.

The principal surgical affections of the tongue are wounds, inflammation, ulcers, hypertrophy, carcinoma, tumors, morbid adhesions, and malformation of its frenum.

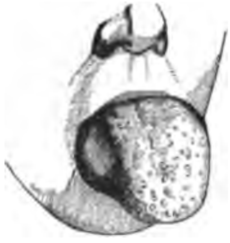
1. *Wounds.*—Wounds of the tongue are most commonly produced by the teeth during epileptic convulsions; but they may also be inflicted by balls, and by design with sharp instruments. The hemorrhage, which, from the great vascularity of the organ, is often copious, is usually easily controlled by ligature and styptics, especially ice and persulphate of iron. When it proceeds from the posterior portion of the tongue, it may be necessary to use the actual cautery. When the ranine artery is laid open, the surgeon may be compelled to tie the lingual artery above the great horn of the hyoid bone.

The edges of the wound are approximated by the interrupted suture, the only retentive means of which the parts admit; inflammation is kept in abeyance by antiphlogistics. Cases occasionally occur in which the tongue is almost completely severed, or in which the anterior extremity hangs only by a few shreds. Our duty obviously is to attempt to save the parts, not to cut them off; and with this view they should be closely approximated by numerous stitches, thus placing them in the most favorable position for speedy reunion. When there is a tendency in the tongue to fall back into the throat, so as to threaten suffocation, or when it has lost its support from the destruction of its muscles, as occasionally happens in gunshot and other injuries, means must at once be adopted to fasten it to the teeth until the danger is over.

In gunshot wounds the ball occasionally lodges in the substance of the tongue, where it may be undetected for a long time, the only evidence, perhaps, of its presence being a fistulous aperture, as in the case narrated by Boyer, where a body of this kind had been retained for four years. A similar instance has been reported by Moizin. The proper remedy, of course, is excision.

2. *Glossitis.*—Inflammation of the tongue, fig. 350, technically called glossitis, of a severe character, is often caused by lacerated wounds, and by the contact of hot water, steam, and various kinds of acids. Not unfrequently the organ suffers secondarily, from extension of the disease in the surrounding parts, as the tonsils, palate, gums, teeth, and salivary glands. In common ptyalism, glossitis always exists; sometimes in a most violent degree. In the old method of treating syphilis, the tongue was often excessively inflamed, and so large as to protrude several inches beyond the teeth. However induced, the disease is frequently very severe, and productive of immense distress, from the great swelling and tenderness of the parts, and the attendant suffocative symptoms. The patient is hardly able to talk or swallow, he pants for breath, and is an object of great pity. The tongue sometimes enlarges very suddenly, to an alarming extent, almost completely filling the mouth, and occasioning excessive embarrassment in respiration. The cause of the attack, which occurs chiefly in middle-aged and elderly subjects, is generally inscrutable. In some of the reported cases it was apparently dependent upon the effects of cold, or a sudden suppression of the cutaneous perspiration combined with gastric disorder. The swelling is characterized by copious and rapid effusion of serum and lymph.

Fig. 350.



Glossitis.

The *treatment* of glossitis is strictly antiphlogistic. If the patient is young and robust, blood is taken freely from the arm, the bowels are thoroughly evacuated, and the system is brought under the full influence of nauseants. The best topical applications are leeches beneath the base of the jaw, followed by large emollient poultices. Bleeding from the ranine veins is sometimes beneficial. In the milder cases the disease often promptly yields to astringent lotions and to counter-irritation to the neck, in the form of embrocations and ammoniated liniments. When the inflammation is of an erysipelatous character, the tongue may be painted several times in the twenty-four hours with a weak solution of iodine, or pencilled once effectually during that period with the solid nitrate of silver. When suppuration, gangrene, or asphyxia is threatened, deep incisions are made, to favor disgorgement of the overloaded vessels and the escape of the effused fluids. The operation, although followed by what might appear to be an alarming flow of blood, is free from danger, and is the only remedy which, in such an event, is worthy of reliance.

Glossitis consequent upon *ptyalism* is often a very painful and intractable disease. The tongue is generally much swollen, and of a fiery redness; patches of lymph form upon its surface, and not unfrequently ugly ulcers make their appearance, thus adding greatly to the patient's suffering. The treatment consists in the daily use of mild aperients, warm applications to the head and neck, and astringent gargles, of which the best, according to my observation, is a solution of acetate of lead, in the proportion of two drachms of the salt to a pint of water. With this the mouth and throat should be freely gargled every hour, or even oftener, care being taken always to retain the fluid for a few minutes in contact with the affected parts. The only disadvantage of this gargle is that it discolors the teeth, an effect which, however, generally disappears in a few days after the discontinuance of the remedy. When the lead disagrees, or proves inefficient, weak solutions of sulphate of copper and tannin, sulphate of zinc, iodide of iron, hydrochlorate of ammonia, or sulphate of alum may be employed as a substitute. When the tongue is very red and painful, ulcerated, or covered with lymph, the most suitable remedy, in general, is the nitrate of silver, drawn lightly over the affected surface once a day.

In the sudden and violent forms of glossitis, resulting from cold or gastric disorder, relief should be attempted by copious bleeding at the arm, speedily followed by an active emetic; the bowels should be freely opened, leeches applied to the chin and side of the jaw, and the tongue deeply scarified. If these measures fail, or there is impending suffocation, laryngotomy is performed.

3. *Ulcers.*—Ulcers of a syphilitic, strumous, mercurial, and simple character often exist upon this organ, and require much judgment for their discrimination and treatment. The history of the case, the habits of the individual, and various other circumstances, will generally afford important information respecting their true nature. The simple ulcer is commonly associated with derangement of the digestive apparatus, and is usually easily distinguished from the other varieties of the affection by its superficial surface, by the slight discoloration of the adjacent parts, by the absence of induration, and by the readiness with which it yields to treatment. The syphilitic ulcer, described in the chapter on syphilis, has a hard base, a foul, irregular surface, more or less discharge, and a copper-colored appearance of the mucous membrane around, with great swelling, pain, and stiffness of the tongue. The strumous ulcer is not always easy of recognition, but its existence may be suspected when there is an obstinate sore on the edge of the tongue, near its centre, with a tumid state of the upper lip, an enlarged abdomen, and other evidences of the strumous diathesis.

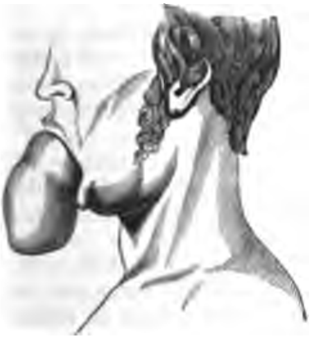
The *treatment* is regulated by the nature of the disease upon which it depends. The syphilitic form is best managed by the exhibition of iodide of potassium, in combination with bichloride of mercury, and the application of nitrate of silver, or dilute acid nitrate of mercury. In strumous ulceration the chief remedies are cod-liver oil and the different preparations of iodine, either alone or in union with mercury. The mercurial variety generally requires no constitutional treatment, a cure being often effected in a few days by the topical use of nitrate of silver, sulphate of copper, acetate of zinc, and other astringent lotions. Similar means, especially the former, with attention to the state of the digestive organs, often succeed in the ordinary form of ulcer of the tongue. In all cases, whatever may be the nature of the exciting cause, the strictest attention should be paid to the diet, bowels, and secretions. This, indeed, is frequently of itself sufficient to effect a cure, while without it no treatment, however well conducted, will be likely to be of much avail.

4. *Diphtheritis.*—A diphtheritic state of the tongue is sometimes observed. It is noticed most frequently in the latter stages of chronic diseases of a malignant or incurable character, accompanied with an anemic condition of the system. It is evidently of an inflammatory nature, and is nearly always associated with soreness of the fauces and pharynx. The tongue is usually somewhat tender and swollen, with a feeling of rawness, or a sense of scalding, and is covered with a thin layer of adherent lymph, of a whitish, grayish, or drab color. The crust sometimes extends over the whole surface of the organ, at other times it occurs in small spots, strips, or patches. The gums, cheeks, lips, roof of the mouth, and even the fauces, occasionally participate in the deposit. On removing this substance, the mucous membrane is found to be somewhat rough, and heightened in color, with, perhaps, here and there a slight fissure, abrasion, or ulcer. A diphtheritic state of the tongue is occasionally produced by salivation.

The *treatment* is mildly antiphlogistic, reliance being placed mainly upon local measures. Weak washes of sulphate of copper and tannin, with honey, nitrate of silver, and sulphate of zinc, are generally sufficient to detach the diphtheritic crust and to remove the inflammation which causes it. Very frequently the best effects follow the employment of a strong gargle of biborate of soda, or the application of equal parts of this substance and of powdered sugar aided by the exhibition of chlorate of potassa.

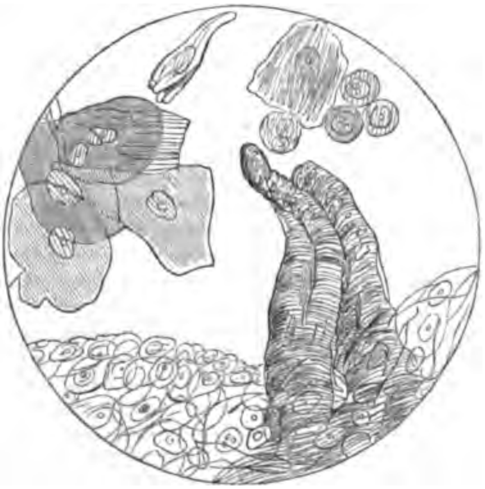
5. *Hypertrophy.*—Hypertrophy of the tongue may be limited to its muscular substance, to its papillæ, or to its mucous investment; or, as not unfrequently happens, all these structures may be simultaneously affected, as in fig. 351, constituting general hypertrophy. In the latter case, which alone concerns the surgeon, the organ is abnormally dense, rigid, and so large as to protrude considerably beyond the teeth, causing serious obstruction to the functions of the mouth, and a wasting discharge of saliva. The prolapsed part is from a few lines to three, four, and even five inches in length, by several inches in breadth and thickness, rough on the surface, preternaturally firm, and of a dark color. The papillæ are often five or six times as large as in the normal state, and the mucous covering has more of the character of bark than of sound structure. The microscopical characters of the affection are well illustrated in fig. 352, from a clinical case, in a child three years of age.

Fig. 351.



Hypertrophy of the tongue.

Fig. 352.



Microscopical characters of hypertrophy of the tongue.

The affection, which is more common in females than in males, generally comes on early in life, being now and then, if, indeed, not always, congenital. The exciting cause is unknown, though occasionally it is directly traceable to inflammation. It is sometimes associated with unusual shortness of the branches of the lower jaw, with great separation of the incisor teeth. Enlargements of this kind are often extremely vascular, from undue development of their minute vessels; and dissection shows that their muscular fibres are transformed into a pale, dense, fibrous substance, with hardly any trace of the normal structure.

The nature of this disease is always easily detected by simple inspection. Its progress is generally tardy, and free from pain and inconvenience, save what results from the bulk of the affected part. When this is considerable, the saliva dribbles constantly from the mouth, and the patient finds it difficult to articulate, chew, and swallow. The countenance has an unseemly aspect, the inferior incisors are forced into a horizontal position, and the jaw itself is not unfrequently considerably altered in its shape. The general health is remarkably prone to derangement, and a not uncommon symptom is disorder of the digestive apparatus.

Very little is to be expected from purely medical *treatment* in this affection, especially when fully developed. In the milder grades marked benefit occasionally follows regular and systematic purgation, low diet, and the exhibition of iodide of iron, iodide of potassium, or Lugol's solution. When the disease is of inflammatory origin, alterative doses of mercury may occasionally be advantageously conjoined with these remedies, but in the congenital variety little is to be expected from such a union. The most valuable local applications are leeches, punctures, or small incisions, and tolerably strong solutions of iodine, sulphate of copper, and kindred articles. I had lately under my care a lad, aged six years, affected with congenital hypertrophy of the tongue, who has been materially benefited by lotions of pyroligenous acid, in the proportion of one drachm to the ounce of water. Under its influence the portruded portion of the organ has become much softer, as well as considerably reduced in volume. Lassus derived great benefit from systematic compression of the tongue by means of a bandage, and a case, treated successfully upon this plan, was related, not long ago, by Professor Syme. If these means fail, the exuberant structures are removed by knife or ligature, as in carcinoma.

6. *Cancer.*—Cancer of the tongue usually exhibits itself in the form of scirrhus, or what is now called epithelioma; encephaloid is extremely rare, and colloid is entirely unknown. The same is true of melanosis.

Epithelioma of this organ is most common in males after the age of fifty. Of 19 cases reported by Dr. J. Hutchinson, the average age was fifty-four, the extremes being thirty-two, and seventy-eight. In 16 cases observed by Dr. Humphrey, 11 were above and 5 under fifty years. The disease generally arises without any assignable cause. The contact of a carious tooth or broken fang, and of the stem of the pipe in smoking, has been accused of originating it, but the idea is far-fetched and insusceptible of proof.

The disease is most commonly situated towards the centre of the tongue, midway between the raphé and one of its edges, where it begins either as a minute, hard, and elastic tubercle, a small, fungous excrescence, or a little sore, chap, or fissure. However this may be, it gradually spreads, and at length degenerates into a foul, excavated ulcer, with indurated, jagged, and elevated edges. The parts around are hard and firm, and not unfrequently the whole organ is as stiff and immovable as a board. The pain, which is sharp and pricking, or dull and aching, is particularly severe at night, and generally radiates about in different directions, especially along the cheeks, ears, and temples. Occasionally it is of a neuralgic character. The size of the affected organ is liable to much diversity; sometimes it is normal, but more commonly it is considerably augmented, and sometimes, again, it is a good deal diminished. In a case recently under my observation, it presented itself as a firm, hard, immovable mass, which accurately filled the trough formed by the dental arch of the lower jaw. At times the organ is so large as to project beyond the lips and to encroach seriously upon the buccal cavity. Its color is usually somewhat heightened, and its edges are often indented by the teeth. As the malady advances, deglutition becomes embarrassed, from the fact that the food can no longer be collected and carried back into the throat; articulation is impaired; and sputation is so frequent and difficult as to constitute a source of real suffering. By and by, the lymphatic ganglions at the base of the jaw enlarge; the gums swell, and present a red, spongy aspect; the teeth loosen and fall out; and the system exhibits all the marks of the cancerous cachexia. Thus day by day the ruthless malady proceeds, until it has effectually accomplished its work of destruction. Sometimes other organs are involved in its progress, but most commonly the carcinomatous action is limited to its original site and neighborhood.

The diagnosis of carcinoma of the tongue can seldom be mistaken. The mode of origin of the malady, its slow but steady progress, its resistance to treatment, the peculiar character of the resulting ulcer, the nature of the pain, the age of the patient, and the sure contamination of the adjacent parts, if not also of the general system, always serve to distinguish it from other affections incident to this organ.

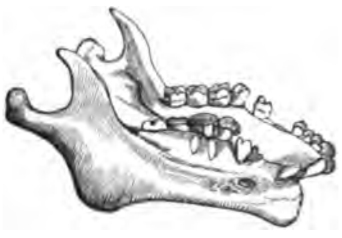
The *treatment* of this disease was generally, at least until lately, by ablation, either by the knife or ligature. The utility of such a proceeding, however, admits of great doubt, and my own opinion has long been that the less we interfere with it in this way the better. The results of experience are certainly strongly corroborative of this conclusion. The ordinary means for improving the general health, allaying pain, neutralizing fetor, and preventing the spread of the disease, are, of course, not neglected. With judicious management, it is astonishing how long, in many cases, the disease may be kept in abeyance, and the final issue warded off.

With a view of preventing the excessive pain and the inordinate flow of saliva, both so distressing in this disease, Mr. Hilton has proposed to divide the gustatory nerve as it runs along the ramus of the jaw, and the operation has so often been performed with advantage as to merit repetition. Mr. Moore has modified the proceeding by combining with it ligation of the corresponding lingual artery, so as to deprive the affected part as effectually as possible of blood. The nerve is easily divided with a curved bistoury as it lies in the shallow groove by the side of the ramus of the jaw, just beyond and within the last molar tooth. The incision should be superficial, and not more than three-quarters of an inch in length.

7. *Erectile Tumors.*—The tongue is occasionally the seat of the erectile tumor. Its most common site is the anterior extremity of the organ, where it presents itself as a soft, elastic structure, of a bluish color, variable in form and size, free from pain, and subject to temporary enlargement under mental emotion. The disease is most frequent in young subjects, and is occasionally associated with similar developments in other parts of the body, as the lip and cheek. The tumor seldom acquires a large bulk, but now and then an instance is seen in which it greatly encroaches upon the mouth, and by its pressure expands the jaw, as in fig. 353, pushing the teeth out of their natural position and even from their sockets.

If seen in time, the morbid growth is readily amenable to *treatment*. The best application is the Vienna paste, used as in making an issue, only with more caution, the organ being drawn forward and steadied the while by a volsella. Or, if the abnormal structure is limited and accessible, it may be removed by ligature, in the same manner as a carcinomatous tumor. Deligation of the lingual arteries has been practised, but with no encouraging results. In one case, at least, the operation was followed by fatal sloughing.

Fig. 353.

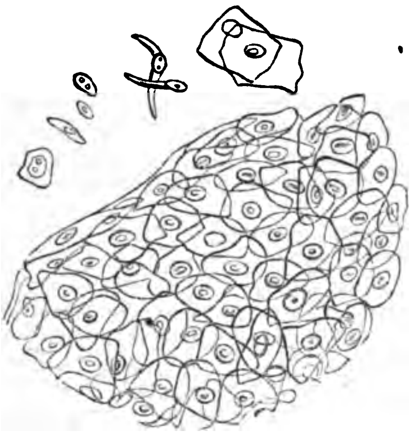


Expansion of the lower jaw from pressure by the tongue, enlarged by erectile tissue.

8. *Wart-like Excrescences.*—A wart-like excrescence sometimes grows from

the tongue; generally from its sides or tip, of a red color, firm consistence, painless, benign, tardy in its development, and seldom exceeding the volume of a small pea or raspberry. It is usually attached by a narrow pedicle, and is somewhat rough on the surface, its structure being of a fibroid character, intermingled with a large number of epithelial cells. The microscopical appearances of a growth of this kind, which I removed from a patient at the College Clinic, are represented in fig. 354, from a drawing by Dr. Packard.

Fig. 354.



Epithelial tumor of the tongue, magnified 472 diameters.

The proper remedy for this growth is excision, or ligation, if there is reason to anticipate much bleeding. When small and recent, it generally yields very readily under the application of chromic acid.

9. *Cystic Disease.*—This affection of the tongue is rare. It consists, as the name implies, of serous vesicles, single or multiple, occupying the muscular substance, and elevating the mucous investment in the form of little tumors, of a semi-transparent appearance, and occasionally quite sensitive. They vary much in size, but usually do not exceed the volume of a cherry-stone, and their number sometimes amounts to several dozens. Occasionally, a solitary cyst of considerable dimensions is observed. The most remarkable case of the kind that I have ever witnessed was sent to me at the College Clinic, in 1859, by Dr. Turnbull. The subject was a small, puny child, aged three weeks, whose tongue was so large as to project fully two inches from the mouth, forming a thick, ungainly-looking mass, pellucid, soft, fluctuating, and effectually preventing sucking. The contents of the tumor were of a thick, ropy consistence, and of a whitish hue.

Cystic disease of the tongue is of obscure origin, and not always easy of recognition. Indeed, it is only when the vesicles approach the surface that its true character can be indubitably established. In cases of uncertainty, the exploring needle should be used. The treatment is by incision, injection, or seton, accord- to the age, structure, and volume of the tumors.

10. *Fibroid Tumors.*—Tumors of a fibrous or fibro-cellular structure are sometimes found in the tongue, either imbedded in its substance, or attached to its surface. They are generally of a spherical or ovoidal form, hard and firm in their consistence, free from pain, and of tardy, painless development. When they spring from the surface of the organ, they usually present a peculiar pendulous, polypoid appearance, their connection being effected by a narrow, slender pedicle. The fibrous tumor of the tongue is occasionally congenital.

11. *Fatty Tumors.*—Only a few instances of the existence of fatty tumors of the tongue have been recorded. More commonly they are situated beneath the organ, over the sublingual gland, where they may acquire the bulk of a large marble, or even of a pullet's egg, as in a case which came under my observation many years ago, in a youth of nineteen. The mass was of an ovoidal shape, of a yellowish aspect, movable, and free from pain, but productive of considerable impediment in speech and mastication by its pressure against the tongue. After removal, which was easily effected, without any loss of blood, it exhibited all the characteristics of a fatty tumor.

12. *Morbid Adhesions.*—The tongue, in consequence of injury of the jaw and of its own substance, is liable to form adhesions to the floor of the mouth, thus greatly impeding its functions. The bands may be single or multiple, and they vary in consistence from that of fibrous tissue to fibro-cartilage, according to their age and other circumstances. Relief is afforded with the knife, a tedious,

bloody, and painful dissection being sometimes necessary to accomplish the object. Reunion is prevented, during the cicatrization, by the interposition of charpie, or, what is better, tin-foil.

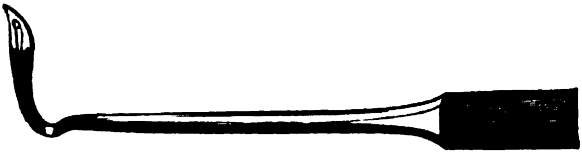
13. *Partial Immobility.*—The muscles of the tongue are liable to a species of contraction, similar to that which occurs in wryneck and other affections. The cause is generally inflammation, attended with plastic deposits, ultimately followed, especially when the case is protracted, by fatty or fibroid degeneration, and inducing thus more or less impediment in the movements of the organ. In a case recently under my care, the patient found it difficult to seize and masticate his food, owing mainly to the contracted and indurated state of the stylo-glossal and hyo-glossal muscles, the subcutaneous division of which at once relieved the parts of their constraint, and restored the tongue to its primitive mobility. Care must be taken, in performing operations of this kind, not to interfere with the proper lingual arteries.

14. *Malformations of the Frenum.*—The tongue is sometimes restrained in its movements by malformation of its frenum, impeding, at first, suction, and, afterwards, articulation. The defect may consist in a short, indurated, and thickened condition of the part, or the little membrane may be prolonged so far forward as to interfere with the action of the tip of the organ; in either case demanding instrumental treatment. The operation, although simple, should not be performed wantonly, particularly as it is occasionally followed by hemorrhage. When necessary, the child's head is held between the knees of the surgeon, who, elevating the tongue with the index and middle fingers of the left hand, carefully divides the frenum to the requisite extent with a pair of narrow-bladed scissors, the points of which are directed downwards, away from the ranine vessels, the great source of danger. The little patient is watched for some time after the operation, lest undue bleeding should ensue.

The frenum of the tongue is sometimes entirely absent, allowing the organ to fall back into the fauces, where, when the parts are quiescent, it looks like a fleshy tumor, attached to the pillars of the palate by a reflection of the mucous membrane. Bransby B. Cooper met with two instances of this kind in the same family. One of the children died from suffocation, at the age of eighteen months, and the other had been repeatedly threatened with a similar accident, the respiration being particularly embarrassed during sleep. When sucking, the muscles seemed capable of retaining the tongue in its proper position. In such a case, an attempt might be made, after paring the lower surface of the organ, to stitch it to the floor of the mouth, though it is not probable that the operation would be successful.

15. *Ablation of the Tongue.*—Ablation of the tongue is sometimes required. The operation may be performed with a knife or ligature, as may seem most expedient. If the affected part is small, and involves the anterior extremity of the organ, it may be included in two incisions, meeting behind at an acute angle, like the lines of the letter V. The edges of the wound are brought together by the common interrupted suture, which serves the double purpose of a retentive and hemostatic agent. If, on the other hand, the disease, from its remote site, is less accessible, a decided preference is given to the ligature, as its use is unattended by hemorrhage. An instrument, such as that represented in fig. 355, and armed with a strong, well waxed, double ligature, or a stout needle, slightly curved, and fixed in a movable handle, is passed through the tongue, from below

Fig. 355.

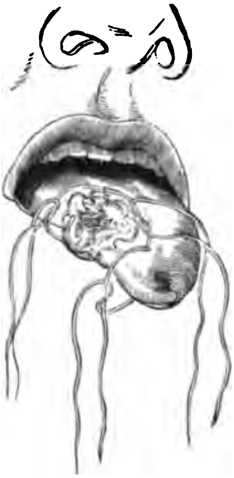


Curved needle for ablation of the tongue.

upwards, on the inner side of the tumor; the noose of the cord having been cut, one portion of it is tied forcibly in front, and the other behind, thus completely isolating and strangulating the diseased structure, as seen in fig. 356. The effect will be the more rapid if the parts to be ligated are previously a little notched with the bistoury; and the pain of the operation may be greatly lessened by the adoption of Mr. Hilton's suggestion of dividing, as a preliminary step, the gustatory nerve. In a few days the eschar separates, leaving an extensive ulcer, which fills up rapidly with granulations.

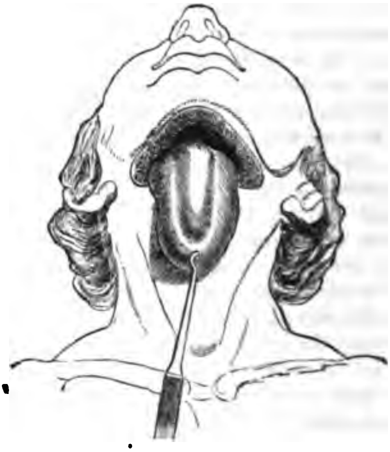
The remarkable feat of excising the whole tongue has recently been performed several times in Europe. The operation affording the most easy access to the affected organ is that of Regnoli. It consists in making, as will be seen by reference to fig. 357, a semilunar incision along the base of the lower jaw extending nearly from one angle to the other, and thoroughly detaching the muscles and other soft structures from the bone. The mouth being thus freely exposed, the tongue is drawn out, and excised by carrying the knife through the sound tissues. If the tumor is very large, it may be necessary to increase the opening by a vertical incision down to the hyoid bone. The vessels are secured as fast as they are divided, and the parts are approximated in the usual manner.

Fig. 356.



Ligation of the tongue.

Fig. 357.

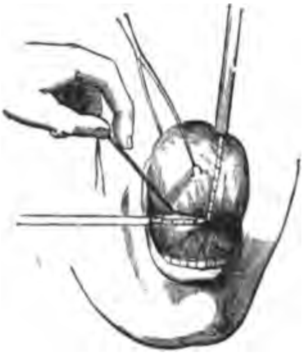


Excision of the tongue.

In order to avoid the hemorrhage attendant upon this operation, Chassaignac has proposed the substitution of the écraseur, fig. 358, for the knife, and it may readily be perceived that if there are any cases in which such an instrument is applicable, this is one of them. The patient, being under the influence of chloroform, would experience no pain, and the ablation being performed slowly would be almost bloodless.

The result of the ablation of the entire tongue may easily be imagined. So cruel a procedure could hardly have any other than a fatal termination, death occurring, if not from shock and hemorrhage, from œdema of the glottis, pneumonia, erysipelas, or pyemia. As to any ultimate or even temporary good it might produce, it is difficult to perceive it. There is a possibility, it is true, that the patient's life might be prolonged for a few days,

Fig. 358.



Removal of the tongue with the écraseur.

nay, perhaps, a few weeks or even months, but this would hardly compensate him for so terrible an ordeal.

SECT. III.—AFFECTIONS OF THE SALIVARY GLANDS.

The salivary glands are not often the subjects of disease or accident. Their protected situation and the peculiarity of their functions are, doubtless, the chief causes of this immunity.

PAROTID GLAND.

The principal surgical affections of the parotid are inflammation, abscess, and certain tumors, chiefly of a malignant character. Its excretory duct is occasionally the seat of earthy formations, of wounds, and fistules.

1. *Parotitis.*—Inflammation of this gland, as an idiopathic affection, is almost wholly confined to the young, constituting what is vulgarly called mumps. It is sometimes seen later in life, and in a few rare instances it is witnessed in elderly persons. It is more common in males than in females, generally prevails as an endemic, or epidemic, and, like most diseases of this class, seldom attacks the same individual more than once. It may occur at any period of the year, but winter and spring are its favorite seasons. Both glands usually suffer, though not always in an equal degree.

The disease commonly begins with some degree of stiffness in the temporo-maxillary articulation, which rapidly increases in severity, and thus materially interferes with mastication. The swelling is particularly conspicuous just in front of the ears, which are often seriously implicated in the morbid action, and is almost always attended with a good deal of pain and constitutional disturbance, without any local discoloration. In most cases, it extends down the neck and along the base of the jaw, imparting thus a singular expression to the features. As the inflammation progresses, the other salivary glands are apt to suffer; and, in the more aggravated forms of the disease, difficulty of deglutition is experienced, from involvement of the tonsils and arches of the palate. It usually reaches its height in about four days, when it begins to decline, and in a few days more terminates in resolution, rarely in suppuration or gangrene. A peculiarity of this variety of inflammation is its tendency to leave the organ primarily affected, and to fasten itself suddenly upon the testicle or mamma. How this transfer is established is wholly inexplicable by any known law of the animal economy, the more so as there is no connection either direct or indirect between these parts. It is most apt to occur in young men, at a period varying from a few days to a week from the invasion of the malady. A violent parotitis, liable to terminate in abscess, and even in mortification, occasionally follows erysipelas, certain forms of fever, as typhoid and scarlet, and the abuse of mercury.

Mumps is generally not a dangerous disease, but it may become so when it extends to the brain and testicle; in the former case, it may destroy life, in the latter it may induce atrophy and loss of function of the affected organ. Several examples of the latter termination have fallen under my observation. When both testes suffer, impotence may be the result.

Parotitis seldom requires much *treatment.* In general, it is easily managed by rest, light diet, aperients, and diaphoretics, with warm applications to the affected parts. Sometimes a warm cataplasm promptly relieves the pain and swelling; at other times, great benefit is experienced from the use of slightly stimulating embrocations, as soap, iodine, or volatile liniment, with a thick covering of raw cotton. Cold applications should be carefully avoided, on account of their repellent tendency. In violent attacks, recourse is had to the lancet, or, at all events, to leeches, active purgatives, and antimonials. If much gastric disturbance exists, along with pain in the back and limbs, a brisk emetic will be useful. When the testicle is threatened by a translation of the malady, a blister should at once be applied over the parotid, in order to re-invite the inflammation. When the disease is fully established in the testicle, the usual antiphlogistic remedies are indicated, and should be employed without delay, lest structural lesion take place. Occasionally a good deal of hardness remains in the parotid region after the violence of the morbid action has disappeared. The proper way to meet this is to use stimulating embrocations and unguents, aided, in obstinate cases, by the constitutional effects of mercury.

2. *Abscess.*—Abscess of the parotid is nearly always of an acute character, the result of simple inflammation, local injury, erysipelas, typhoid fever, smallpox, and other eruptive affections. The presence of matter is indicated by discoloration of the skin, circumscribed swelling, and high constitutional disturbance. The parts pit on pressure, the pain is excessive, and the patient is unable to open his mouth. Sometimes the swelling is remarkably diffused, in consequence, apparently, of the involvement of the extensive venous network both of the gland itself and of the surrounding parts. The fluctuation is generally very obscure, on account of the manner in which the contents of the abscess are bound down by the cervical fascia and capsule of the gland. Owing to this circumstance, the true nature of the disease is apt to be overlooked, and the pus allowed to burrow about in different directions; thus producing the most serious mischief, opening, perhaps, after having induced the most violent suffering, into the auditory tube, or extending down the neck along the great vessels, and causing extensive havoc in the connecting cellular tissue. In some instances the fluid passes round the trachea, and finally destroys life by bursting into the chest. To prevent these disastrous effects, and to relieve the horrible pain which always attends the disease, an early and free incision should be made vertically into the most prominent, and also, if possible, into the most dependent, part of the swelling, and kept open by means of a tent, until the cavity of the abscess is in great measure obliterated. The system, meantime, must be properly supported by stimulants and anodynes.

3. *Gangrene.*—Mortification of this gland occurs chiefly in erysipelas, typhoid fever, scarlatina, and smallpox. Sometimes it follows violent salivation. Fortunately, however, it is very rare in any form of disease. The sloughing is usually most extensive in the connecting cellular tissue, but occasionally it affects the glandular substance also, which it may completely destroy, as I have had occasion to observe in several cases. In one of these not a vestige of the organ was left, its former site presenting a deep hollow, extending down to the ramus of the jaw and the auditory tube. When gangrene is impending, or has actually taken place, free incisions should be made, followed by the application of a yeast or port wine poultice, with the nitric acid lotion and appropriate constitutional means.

4. *Morbid Growths.*—Tumors of a fibrous, scirrhous, melanotic, and encephaloid character, are sometimes developed in the parotid, or in the cellular and adipose tissue enveloping it. In most cases they appear to originate in the lymphatic ganglions imbedded in its substance, placed upon its outer surface, or situated in its immediate vicinity. The precise nature of the disease can rarely be determined by outward inspection, or manual examination. Such tumors usually grow rather slowly, but they are almost always accompanied by severe pain, from their pressure on the adjacent nerves; the deformity is great, sometimes hideous, and the patient is unable to masticate and open his mouth. In their volume they vary from that of a walnut to that of a fœtal head. The largest are usually the encephaloid and melanotic, the scirrhous and fibrous rarely attaining much bulk. Their tendency is to destroy life, either by constitutional irritation, or by ulceration and profuse discharge.

These tumors, especially the encephaloid, occasionally show themselves at a very early period, and they then usually run their course with great rapidity, often causing death in eight, twelve, or fifteen months. The scirrhous form is most common in elderly subjects, and is distinguishable by its extraordinary hardness, by its tardy progress, and by its comparatively small bulk. The melanotic tumor is, in general, easily recognized by its peculiar complexion, by its lobulated surface, and by its march, which is intermediate between that of scirrhus and encephaloid. It appears at various periods of life; but is most common in young adults.

During their progress these tumors occasionally encroach so much upon the vessels of the neck as materially to diminish their caliber. Indeed, cases have been reported in which both the carotid artery and internal jugular vein were completely obliterated. The nerves are always more or less severely compressed, and the consequence is that the local suffering is generally very distressing, especially when the morbid growth is uncommonly large, firm, or deep-seated.

5. *Extirpation.*—Considering the narrow space in which the parotid gland is situated, and the complexity of the relations which it sustains to the surrounding structures, is it possible to extirpate it in the living subject? This question, so interesting in every point of view, has not been answered alike by all writers. Allan Burns thought the operation impracticable, and a similar opinion has been strenuously advocated by other authorities. Notwithstanding this, however, it has, undoubtedly, been repeatedly performed successfully, as every one familiar with the history of surgery well knows. Dr. Brainard has analyzed ninety-one cases, including two by himself, in which, he affirms, there was no doubt whatever of the extirpation of the entire gland. It would, therefore, be great folly either to doubt its possibility, or to deny its propriety. That the operation is difficult of execution, requiring the most accurate knowledge of the anatomy of the parts, and the most consummate skill, is certain, and unless the surgeon is fully possessed of these important qualities, failure, if not disgrace, will be sure to attend his efforts. It should be added, however, by way of encouragement, that it is much easier, in almost every instance, to remove a diseased than a healthy gland of this kind. In the former case, its fibrous envelop is usually so much condensed as to inclose and circumscribe the organ, rendering it thus perfectly distinct and separate; whereas, in the latter, it is a soft, ill-defined mass, which it is extremely difficult, even in the dead subject, to disengage from the surrounding structures by the most patient and cautious dissection.

In performing the operation, the patient lies upon a table, on the sound side of his face, with the head and shoulders well elevated. When the tumor is small, not exceeding the volume of an egg, a single incision, extending obliquely down in front of the ear from a short distance above the zygomatic arch of the temporal bone to an inch below the angle of the jaw, will usually afford sufficient space for our purpose; but in all other cases it should be crucial, elliptical, or T-shaped. The form of the incision, however, is of little moment, provided it is large enough to admit of free access to the diseased mass. The flaps having been dissected up in the usual manner, the tumor may next be lifted from its bed, either from above downwards, or, what is better, from below upwards. Whichever plan be adopted, the utmost caution is necessary in liberating the deep-seated parts, on account of the danger of wounding the internal carotid artery and the jugular vein, with their accompanying nerves. In executing this step of the operation, more reliance should be placed upon the handle of the knife than upon its point, which can hardly be employed, in a situation so deep, narrow, and full of important structures, without the risk of injury. When the connecting tissues are unusually soft or brittle, the tumor may be partly wrenched from its bed with the fingers; but such a proceeding is always objectionable, since it is liable to be followed by undue inflammation. The digastric muscle is frequently expanded over the tumor, and requires division.

The extirpation of this organ, for whatever object it may be undertaken, must necessarily be attended with loss of blood; but this is never, or, at least, rarely, very great, if the dislodgement of the gland is effected from below upwards instead of in the opposite direction. By this procedure the external carotid will be exposed at an early stage of the dissection, and may, therefore, be readily commanded either by the finger or the ligature. I can see no reason for securing this vessel as a preliminary measure; for, in the first place, it is not always divided, and, in the second, the expedient is often impracticable on account of the great volume of the tumor. In the latter case, advantage might be derived from compression of the common carotid. When this vessel is much shrunken from the pressure of the tumor, the chief source of the hemorrhage is the recurrent circulation.

The operation is always followed by paralysis of the corresponding side of the face, on account of the division of the motor branch of the seventh pair of nerves. The loss of power may last during life, or it may gradually disappear, at least in part. The resulting inflammation is generally severe, and requires the greatest vigilance in the management of the case. The patient may perish from the shock of the operation, from loss of blood, or from inflammation of the throat and larynx. Recurrence of the disease may confidently be expected when the operation has been performed on account of a malignant growth, generally at a period varying from three to six months.

Extirpation of this gland was first performed in this country by Dr. Warren, of Boston, in 1798. To the late Dr. George McClellan, of this city, however, is due the credit of having generalized the operation. Of 11 cases in which he executed it, 10 recovered.

6. *Tumors over the Parotid.*—Tumors, principally of the nature of degenerated lymphatic ganglions, not unfrequently form upon and around the parotid gland. They often acquire a considerable bulk, and, enlarging in different directions, choke and compress the proper substance of the organ, thus causing it to waste and shrink. Excision, under such circumstances, may induce the unwary to suppose that the parotid has been removed, when, in fact, the morbid growth was altogether of an adventitious character. There is reason to believe that many, if not all, of the earlier operations in this region were of this description. I have myself repeatedly extirpated diseased lymphatic ganglions in this situation.

Cysts, filled with serous, sero-sanguinolent, or bloody fluid, are sometimes found here, perhaps partially imbedded in the parotid gland, and crossed by the branches of the facial nerve, thus rendering their removal very difficult. Their contents occasionally consist of pure blood, either fluid or grumous, and interspersed with granular matter and crystals of cholesterine. Their walls are generally thin and polished, but in rare cases the inner surface exhibits a peculiar reticulated appearance not unlike the right auricle of the heart. They may acquire a considerable bulk, and usually impart a distinct sense of fluctuation.

A few years ago, I removed from the parotid region of a gentleman, aged fifty-eight years, a melanotic tumor, which had attained the volume of a hen's egg, and required a very tedious dissection on account of its cystic structure, and its intimate relations with the surrounding parts.

In extirpating morbid growths in this region, care should be taken to guard against injury of the branches of the portio dura, and also of the duct of Steno, the integrity of which should never be disturbed in any case whatever. The operation should be conducted upon the same principles as in excision of the gland itself.

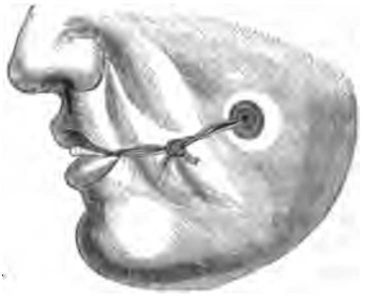
7. *Affections of the Duct of Steno.*—This canal occasionally suffers in wounds of the face. The proper treatment is to put the edges of the divided structures in their natural relations, and to maintain them thus by several points of the twisted suture, aided by perfect quietude of the cheek. The object is to effect accurate parallelism between the two ends of the divided tube, and, when this is done, there is little danger of any untoward occurrence.

Earthy concretions are now and then met with in this tube. They are generally of an ovoidal shape, of a whitish color, rough on the surface, and composed of phosphate and carbonate of lime in union with a little animal matter. After having lain dormant for an indefinite period, their presence finally awakens severe pain, and sometimes even a great deal of constitutional excitement. In a case that was under my charge several years ago, in a man, aged thirty-nine, there was excessive swelling of the cheek, with a ridge-like elevation in the course of the excretory tube, and a diffused, erysipelatous discoloration of the skin. The parts were very hard and tender, the jaw was moved with extreme difficulty, and there was high inflammatory fever. Being satisfied that there must be a salivary calculus, I made a free incision into the orifice of the distended duct, on the inside of the mouth, but nothing followed, except a small quantity of a whitish, glutinous substance, intermixed with a few drops of pus. The concretion did not escape until the next day. The pain and swelling rapidly subsided, but for nearly six months the canal continued to be greatly distended, in consequence of the partial closure of its orifice, which required occasional puncture and dilatation to effect a permanent cure. When the inflammation caused by the foreign body is very severe, leeches, cataplasms, purgatives, and other antiphlogistic means are indicated. Extrusion is effected, as soon as the diagnosis is established, by a free incision into the duct, on the inside of the mouth. Sometimes the calculus projects at the orifice of the canal, and then the forceps take the place of the knife.

A *fistule* of the duct of Steno is often a very grievous affair, and may be caused by wound, ulceration, abscess, or gangrene. Some of the very worst forms of the lesion that I have ever witnessed were produced by sloughing from ptyalism. Such an occurrence is always to be deplored, inasmuch as it often involves great deformity of the features, and irremediable chasms in the soft substance. A fistule of this duct is not only unseemly and inconvenient, but it is attended with the loss of a fluid that plays an important part in the animal economy.

The principles of treatment are very simple, for they consist merely in changing the direction of the abnormal orifice, and in closing the fissure in the cheek. When the occurrence depends upon a recent wound, all that is, in general, required is the use of the twisted suture, and a compressing bandage; but if some time has elapsed, it may be necessary, in addition, and as a preliminary step, to pare the edges of the opening, in order to place them in a condition favorable to the adhesive process. In fistule caused by abscess, ulceration, or suppuration, a cure may sometimes be effected by cauterizing the parts with nitrate of silver, acid nitrate of mercury, or a heated probe. A slight eschar is thus formed, and, granulations subsequently springing up, the saliva gradually resumes its natural channel. In the more obstinate forms of the affection, the plan suggested by the late Dr. Horner may be adopted, as holding out a fair prospect of success. It is both simple and easy of execution. The external orifice having previously been elongated a little in the direction of the zygomatic muscle, the head is supported upon the breast of an assistant, and a broad wooden spatula is introduced into the mouth, opposite to the site of the fistule. With a large, sharp saddler's punch the whole of the diseased structures, tube and all, is then removed, when the opening in the integuments is immediately closed with the twisted suture. Cold water-dressing is applied until the completion of the union, which usually happens in a few days.

Fig. 359.



Seton for the cure of salivary fistule.

Sometimes a good cure may be effected with a seton, consisting of a thick well waxed silk cord, passed through the fistule, brought out at the corner of the mouth, and tied upon the cheek, as in fig. 359. The treatment is particularly applicable to those cases in which the inner orifice of the fistule is nearly obliterated. When the opening has been re-established, the seton is withdrawn, and the orifice in the skin closed by suture.

When the fistule is very large and obstinate, as when it depends upon a loss of substance, autoplasty may become necessary.

SUBMAXILLARY GLAND.

The submaxillary gland, from its protected position, and the manner in which it is isolated by the cervical fascia, is seldom the subject of disease. Of the

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malignant affections, to which, in common with the parotid, it is liable, scirrhus is the most frequent, though it is in reality extremely rare. The few cases in which it has hitherto been observed occurred in elderly persons, rather as a secondary than as a primary malady. In carcinoma of the lower lip, in epulis, and in encephaloid of the lower jaw, it occasionally becomes involved during the progress of the original disease, or after this has been removed by operation. Sometimes the gland is enlarged and indurated from interstitial deposits, caused by the irritation of a tooth, cancer of the tongue, or disease of the surrounding lymphatic ganglions; but such an affection is very different from true scirrhus, and generally subsides with the cessation of the exciting influence.

Scirrhus usually begins in the form of a small, hard tumor, which gradually increases in size until it acquires the bulk of a hen's egg, or even of a large orange. It is slow in its progress, has an irregular surface, and is the seat of a constant darting, pricking, or lancinating pain. In time, the adjacent lymphatic ganglions enlarge, the gland contracts firm adhesions, the integuments ulcerate, and the general health declines, as in scirrhus in other parts. When the tumor encroaches upon the mouth it interferes with speech and mastication, if not also with deglutition.

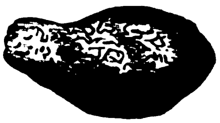
As the diagnosis between this affection and simple enlargement of the gland cannot always be certainly established, sound judgment imperatively dictates the propriety of a thorough investigation of the case, and the removal, if possible, of all sources of irritation, before we resort to so serious an undertaking as an operation. If the enlargement and induration are the result of ordinary causes, the mildest measures will often be sufficient to effect a cure, after attention to this circumstance. The removal of a carious tooth, or a dead piece of jaw, with a few doses of aperient medicine, will generally enable the gland promptly to regain its original characters. When the malady is malignant, excision alone promises any relief, but this, unfortunately, is seldom permanent. The operation necessarily involves the facial artery, and, therefore, requires some degree of dexterity. One incision, extended horizontally over the centre of the tumor, in the direction of the lower jaw, will generally suffice. The facial artery will usually be found at the posterior part of the diseased mass, and should always be tied before it is divided. By this procedure the operation is rendered almost bloodless. The sublingual artery and the hypoglossal nerve must be carefully avoided. In separating the gland from its deep connections, the finger and handle of the knife will afford good service. When the tumor is uncommonly large, the horizontal incision is intersected by a vertical one, the two representing the lines of the letter T.

Ordinary tumors, as enlarged lymphatic ganglions, occasionally require removal from this region. In general, they yield to anti-strumous remedies, aided by a proper regimen; but when they resist these measures, and give rise to serious symptoms, nothing short of excision will avail. Such an operation is usually sufficiently simple, requiring less skill on the part of the surgeon than anatomical knowledge. Sometimes the tumor is immovably fixed in its situation, and then, if it be of large size, a tedious and careful dissection becomes necessary. The course which I generally adopt is to make a horizontal incision along the base of the jaw, an assistant holding the facial artery out of the way with a blunt hook. In an operation of this kind, a few years ago, the vessel escaped the knife, but secondary hemorrhage ensued after the application of the dressings, apparently from one of the nutrient branches of the submaxillary gland. This was readily secured, and the patient soon recovered.

In 1842, I met with a remarkable case of *cystic tumor* in the submaxillary gland of a middle-aged, married lady, the mother of several children. It had made its appearance about seventeen years previously, and was somewhat larger than a hen's egg, soft, fluctuating, free from pain, and unaccompanied by any enlargement of the subcutaneous veins. Upon being punctured, a thick, viscid fluid escaped, rendering it highly probable that it consisted merely of altered saliva. The patient was unwilling to submit to an operation, otherwise I should have evacuated the contents of the cyst, and injected it with a weak solution of iodine.

The *excretory duct* of the submaxillary gland, like that of the parotid, is not unfrequently the seat of calcareous concretions. They occur in both sexes, chiefly in middle-aged and elderly subjects, though the young are not wholly exempt from them. Occasionally, indeed, they are congenital, as in an interesting case observed by Dr. Burdel, of Vierzon. Their composition is phosphate and carbonate of lime, cemented together by a small quantity of animal matter. A calculus of this description of the left submaxillary gland, removed from a young man, is sketched in fig. 360. It was of a pyriform shape, rough, and of a whitish color; its length was upwards of one inch. Its presence was productive of great pain and swelling at the side of the tongue, attended, for several weeks, with inability to masticate, and excessive difficulty of swallowing. The diagnosis of the case was perplexingly obscure, until the concretion protruded at the orifice of the duct, from which it was finally withdrawn with the thumb and finger.

Fig. 360.



Salivary calculus.

SUBLINGUAL GLAND.

The principal disease of the sublingual gland is *ranula*, a peculiar form of tumor caused by obstruction of its excretory ducts, and the retention of its peculiar secretion. The swelling seldom exceeds the volume of a pigeon's egg; but it may be so large as to encroach seriously upon the surrounding parts, impeding articulation and deglutition, pushing the tongue against the roof of the mouth, displacing the teeth, and bulging out underneath the chin. It has a grayish, translucent aspect, like the belly of a frog, whence its name; is of an irregularly oval shape, and contains a glairy, ropy fluid, like the white of eggs. Sometimes the contents are thin and watery, sometimes thick and pultaceous, and sometimes, again, of a yellowish, oily nature, similar to the synovial liquor of the joints. Particles of gritty matter, probably a mixture of phosphate and carbonate of lime, are occasionally interspersed through them.

Most of the cases of ranula that I have seen occurred in young subjects between the ages of eighteen and thirty. The disease, however, is not peculiar to this period of life. It is generally slow in its march, causes little or no suffering, and is unattended with derangement of the general health. These circumstances, together with its singular appearance, and its situation beneath and by the side of the tongue, always serve to distinguish it from other affections. The croaking state of the voice is observed only in cases of long standing and large bulk, and, as it is liable to attend other diseases of the mouth, is of no diagnostic value. When any doubt exists, it may be promptly dispelled by the introduction of the exploring needle.

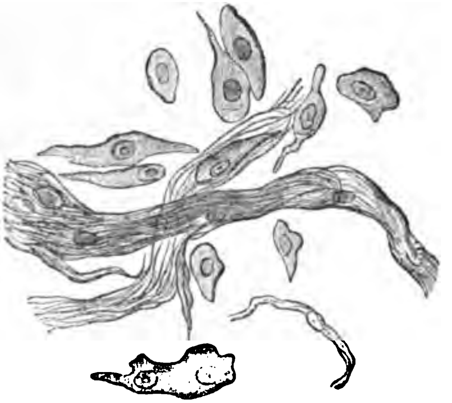
It is not difficult to conceive how ranula is produced. It is essentially an encysted tumor. The orifices of the excretory canals of the glands being closed, either by direct adhesion, or by the interposition of some adventitious substance, the proper secretion, instead of passing off as fast as it is furnished, accumulates in the interior of the organ, causing, by its pressure, the absorption of a considerable portion of its substance, and thus forming a tumor which possesses all the properties just assigned to it. The retained fluid itself, as has been seen, undergoes most important changes.

The *treatment* of ranula must depend upon circumstances, as the age and volume of the tumor. In recent cases, it has been proposed to afford relief by removing the obstruction with a probe, frequently introduced into the orifices of the affected ducts; but all such attempts, if not futile, are exceedingly tedious and uncertain, and hardly worthy of trial. In my own hands, the most satisfactory results have uniformly attended excision of a portion of the sac, in the form of an oval flap, with a hook and a pair of scissors. The wound soon suppurates, and gradually heals by the granulating process. Some surgeons rely upon the seton; and lately it has been advised to inject the tumor with tincture of iodine, on the same principle as in hydrocele. Both methods are feasible, and usually effective. When the ranula is very bulky, or transformed into a solid, gristly mass, extirpation will be necessary, and it is well to know that the operation is, in general, neither difficult nor dangerous. A few years ago, I dissected out a growth of this kind, fully as large as a hen's egg, from the mouth of a young lady, who had long been the subject of paraplegia and dyspepsia. It was quite hard and solid, of a pale-yellowish color, not unlike a mass of fat, and was productive of no other inconvenience than that which resulted from its bulk. Making a longitudinal incision along the side of the tongue, the flaps of mucous membrane were reflected to each side, when the tumor was easily enucleated with the handle of the scalpel. The parts speedily healed, and there was no return of the disease.

The sublingual gland is liable to *calculous* formations, but the occurrence is extremely rare. I have seen but one specimen of the kind, and this I removed from a man, aged fifty-four, after it had caused, for several weeks, severe local distress, attended with great difficulty in moving the tongue. Paré met with a case of ranula in which he found five of these concretions, the largest of which was as big as an almond. The irritation occasioned by their presence had produced an immense abscess under the tongue.

Carcinoma of this gland, possessing all the characteristic features of this disease as it occurs in other parts of the body, is occasionally observed. The affection is very uncommon, and I have seen only one case of it. The patient, a laborer, aged fifty-six, had always been in good health up to May, 1858, when he noticed a swelling on each side of the middle line, just below the tongue. When he came to the clinic of the Jefferson College the following November, the tumors were excessively hard, and of the size of a small almond; the pain was of a sharp, shooting character, and the movements of the tongue were much restrained. Excision being effected, a portion of the growth was subjected to microscopic inspection by Dr. Packard, who kindly furnished me with the annexed sketch, fig. 361, of its minute structure. The disease reappeared in three weeks, and gradually extended to the gums and jaw, forming a large tumor, exhibiting all the external marks of scirrhus. The glands along the base of the jaw were enlarged, and the general health was becoming rapidly undermined.

Fig. 361.



Scirrhus of the sublingual gland; minute structure. Magnified 472 diameters.

SECT. IV.—AFFECTIONS OF THE PALATE.

The principal surgical affections of the palate are wounds, inflammation, ulceration, and congenital deficiencies, analogous to those of the upper lip.

1. *Wounds.*—Wounds of the palate, both hard and soft, may be incised, lacerated, punctured, or gunshot, and usually exhibit the same phenomena as similar lesions in other parts of the body. Considerable hemorrhage is sometimes present, but this commonly ceases of its own accord, or is easily arrested by astringent lotions. When there is no loss of substance, and, consequently, little or no gaping, mere rest of the palate for a few days will generally be sufficient to effect a cure; when the reverse is the case, the interrupted suture may

be necessary, the principle on which it is introduced being the same as in the operation for cleft-palate described below.

2. *Inflammation.*—Inflammation of the soft palate is usually associated with inflammation of the uvula and tonsils; it may be common or specific, and the treatment, consequently, must be modified according to the nature of the complaint. In the ordinary form of the disease, the principal remedies are purgatives, leeches to the neck, astringent gargles, and the application of nitrate of silver; in the specific, these remedies are conjoined with constitutional treatment, embracing the milder preparations of mercury, and the iodide of potassium.

3. *Abscess.*—Abscess of the soft palate is not uncommon, and may exist by itself or in union with suppuration of the tonsils. Indeed, there is reason to believe that the former is often mistaken for the latter, owing to the intimate connection of the two organs, and the fact that inflammation of the one is extremely prone to extend to the other. The treatment is the same as in tonsillitis, an early and free incision being made to let out the matter.

4. *Ulceration.*—Ulceration of the palate is generally dependent upon a syphilitic taint of the system. The sores, at first superficial, often extend through the entire thickness of the curtain and arches of the palate, and usually exhibit a foul, unhealthy aspect, with a copper-colored appearance of the surrounding surface. The breath is fetid, the patient is obliged to clear his throat frequently of inspissated mucus, and there is derangement of the general health, with, perhaps, syphilitic eruptions of the skin, iritis, and other evidences of constitutional contamination. The diagnosis is determined mainly by the history of the case, and by the peculiar features of the ulcerative process. The treatment is decidedly constitutional; aided, if the patient is robust, by venesection and leeching. Excitement having been subdued, a mild course of mercury is instituted, and the sores are effectually touched once a day with dilute acid nitrate of mercury, nitrate of silver, or sulphate of copper.

The hard palate may suffer in the same manner as the soft. The worst form of ulcer usually met with occurs in children and young persons, as the result of a strumous, syphilitic, or mercurio-syphilitic taint of the system. The patient looks pale and sickly, and the disease manifests an obstinate disposition to spread, sparing neither mucous membrane, fibrous structure, nor bone, which are often destroyed to a most serious extent. The mischief thus produced can frequently be repaired only by artificial means.

5. *Tumors.*—Solid, semi-solid, and cystic tumors are liable to form in the soft palate, and may acquire such a bulk as seriously to impede mastication, deglutition, and respiration. Perhaps the most common of these growths is the recurring fibroid, of a pale yellowish appearance, and of a tolerably firm consistence, its intimate structure being of a wavy, fibrous nature, with here and there an oil cell. It is sometimes surrounded by a distinct cyst, and generally returns soon after extirpation. Malignant disease, properly so called, of the palate, is very uncommon. It is characterized by its rapid growth, by its intimate connection with the neighboring tissues, and by the peculiar nature of the accompanying pain.

The proper treatment of these various formations is early excision, and the procedure will be greatly facilitated if the tumor be previously seized and drawn forwards with a volsella, or stout hook. No apprehension need be entertained respecting hemorrhage, as no large vessels are in the way; should it prove troublesome, recourse must be had to styptics, and, if need be, to the actual cautery.

The *vascular erectile tumor* of the vault of the palate is uncommon. It usually shows itself as a soft, reddish, bluish, or livid growth, from the size of a pigeon's egg to that of a walnut, of a rounded shape, smooth on the surface, and pulsating synchronously with the heart, especially when it is of a strongly arterial character. When it is composed chiefly of a network of veins, there is generally an absence of pulsation, and, in that event, the tumor is also much darker. Sometimes the tumor ulcerates, especially when it has attained a large bulk, and a case has been recorded in which it was subject to periodical hemorrhages, apparently vicarious of the menses.

The diagnosis of such a growth is commonly very easy. The history of the case, the absence of pain, and the peculiar color of the tumor always serve to distinguish it from abscess, almost the only affection with which it is liable to be confounded.

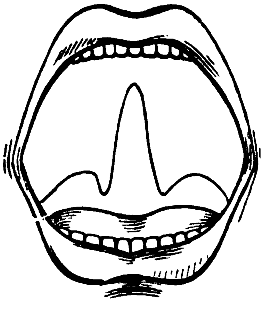
If the tumor be purely venous, the most appropriate remedy will be excision; if arterial, ligation or the actual cautery. When the growth is of the latter description, and of large bulk, almost filling the roof of the mouth, any operation intended for its relief will be likely to prove extremely formidable, and should therefore not be undertaken without due precaution.

Of genuine *aneurism* of the vault of the palate I saw a very interesting case in 1849, in a young army officer who had been accidentally stabbed with a small knife upwards of two months previously, the blade opening the superior palatine artery on the right side. The tumor, which was of a spherical shape, and about the volume of a marrowfat pea, pulsated synchronously with the heart, and was of a soft, spongoid consistence, readily yielding under pressure. A cure was promptly effected by laying open the tumor, and tying the artery at both ends. The only other case of this rare disease of which I have any knowledge, occurred to Teirling, who effected a cure with the actual cautery.

A case of *encysted tumor* in this situation, of the size of a hazel-nut, and filled with a yellowish serous fluid, has been described by Saucerotte. It was punctured, and successfully injected with tincture of iodine. It had no doubt its origin in an obstructed mucous follicle.

6. *Cleft Palate.*—The palate is subject to congenital deficiency, analogous to hare-lip, and bifid spine, with which, especially the former, it not unfrequently coexists. The defect occurs in various degrees, being sometimes very trifling, at other times exceedingly great. In the most simple form, which is, however, not the most common, it presents itself as a small, triangular fissure, illustrated in fig. 362, extending through the uvula and the posterior portion of the velum, the remainder of the palate being perfectly natural. Sometimes, indeed, the uvula alone is affected. In a second series of cases, the cleft involves the whole of the soft palate, or this structure and, perhaps, a part of the palate bone. In a third variety of form, both the soft and hard parts are deficient, the slit reaching from one end of the palate to the other. Fourthly, the cleft is occasionally associated with a cleft in the alveolar process of the maxillary bone, on one or both sides, and even with hare-lip. Finally, cases occur, though rarely, in which the hard palate alone is implicated.

Fig. 362.

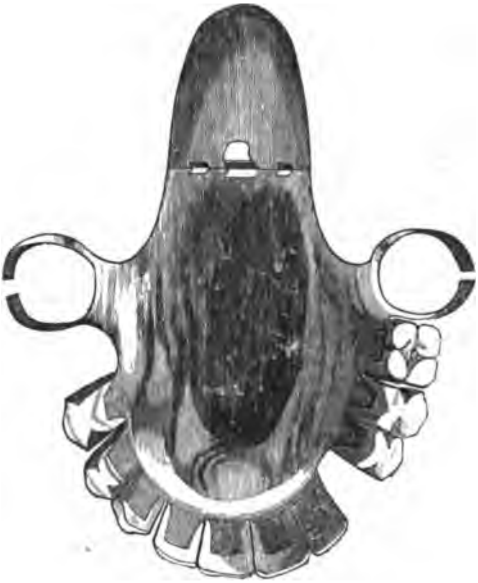


Cleft palate.

The width of the gap, like its length, is subject to considerable diversity. Thus, it may not exceed a few lines, or it may be so great as to constitute a hopeless deformity. When it is limited to the soft palate, it is always of a triangular shape, the base being below, the apex above. When it involves both the soft structure and the roof of the mouth, it is generally of an oblong quadrilateral figure, the nasal septum extending along its centre, and dividing it, as it were, into two equal parts. The edges of the fissure, whatever may be its size and form, are always rounded off, and of a firm, fibrous consistence, being often pared with much difficulty.

The *effect* of this condition of the palate, during infancy, is interference with suction and deglutition, and afterwards with mastication and articulation. The degree of the impediment is generally in proportion to the extent of the cleft. In the more severe forms, much of the food passes into the nose, where, causing irritation, it excites sneezing, inflammation, and even ulceration. From the imperfect control which such persons have over the muscles of the palate, both fluids and solids are very liable to descend into the windpipe. The speech is guttural and nasal, and frequently so indistinct as to render it, in great degree, incomprehensible.

Fig. 363.



Obturator for the palate.

The milder forms alone of this affection admit of cure by operation. When the gap is very wide, or extends the entire length of the palate and mouth, all that can generally be done is to insert an obturator, which, by closing the abnormal opening, enables the individual to masticate and swallow with more facility, and also somewhat improves his speech. Such a contrivance, of which fig. 363 conveys a sufficiently accurate idea, may readily be supplied, with or without teeth, by any ingenious dentist. Its great requisites are lightness and accurate adaptation.

An excellent obturator, far superior to anything of the kind heretofore employed, has been invented by Dr. Kingsley, of New York, and is likely to come into extensive use. It is composed of elastic vulcanized rubber, and is moulded with great accuracy to the size and shape of the fissure. It is extremly light, is easily retained in position, and readily contracts and expands under the action of the muscles of the palate; so that, with proper training, the individual soon learns to speak with a degree of facility and distinctness altogether surprising.

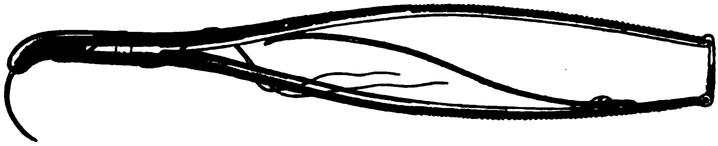
When the case is a suitable one for surgical interference, the operation is not performed at once, but, instead of this, the patient is subjected to a course of preliminary training, to enable him to bear the necessary manipulations. With this view, the palate is frequently touched with the finger, or rubbed with a toothbrush, probe, or spoon, until it no longer resents the contact of the foreign body, but is perfectly calm and quiet under the most protracted exercise. This treatment may occupy several weeks, or even a longer time, depending upon the irritability of the parts, and the courage of the patient. But this, important as it is, is not all. Another point, equally necessary, is the co-operation of the patient, without which success will be entirely out of the question. Staphylorraphy has occasionally been performed upon subjects under twelve years; but, in general, it is best to wait until after the age of fifteen. Even then, it should not be attempted unless there is the strongest reason to believe that the individual will be entirely passive during the perplexing and fatiguing ordeal to which he is obliged to submit. It is hardly necessary to add that, at the time of the operation, he should be perfectly well and free from cough.

The operation, technically called *staphylorraphy*, may be considered as consisting of three stages. In the first, the surgeon pares the edges of the fissure; in the second, he introduces the requisite number of sutures; and, in the last, he ties the ligatures.

The patient sitting on a chair with a firm back, his head is supported upon the breast of an assistant, and held in such a manner as to allow the light to fall in a full stream upon the palate. The jaws being widely separated, and the tongue duly depressed, either by the patient's own efforts, or by another assistant, the first stage of the operation is begun. The most suitable instruments, according to my experience, for seizing and paring the parts, are a pair of long, slender forceps, and a knife similar to Beer's cataract knife, only much longer in the handle. If the fissure is very wide, as little of the edges should be removed as possible; when the reverse is the case, a piece not less than a line in breadth is sliced off on each side. The knife is entered at the upper angle of the cleft, and drawn steadily downwards until it cuts itself out below. The process is then repeated on the opposite margin, the forceps being employed, meanwhile, for putting the parts gently on the stretch. Some bleeding necessarily attends this stage of the operation, but this is commonly over in a few minutes, and should never be treated with astringents, as they have a tendency to impair adhesive action. A respite is now afforded, that the patient may recover from his fatigue, and regain his self-possession, which, although this part of the operation is neither painful nor protracted, is often severely tried.

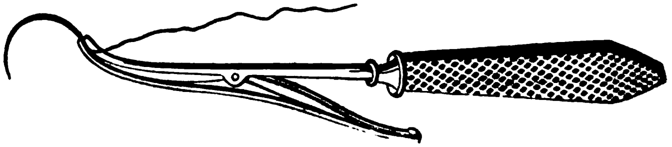
The second stage of the operation consists in introducing the sutures, of which three, placed equidistant from each other, are generally sufficient. If the refreshing of the edges of the fissure is troublesome, the arrangement of the sutures is still more so. In truth, it may be regarded as the most difficult part of the whole procedure. It is executed with a needle, of the size and shape presented in fig. 364, armed with well waxed silk thread, or, what is far preferable, silver wire, and held in the jaws of a pair of forceps, constructed for the purpose. The one which I am in the habit of using is here delineated, and is an unexceptionable instrument. The forceps of Schwerdt, seen in fig. 365, if properly constructed, are also well adapted to the object. The first suture is introduced at the inferior extremity of the cleft, the needle being carried across from left to right, entering and issuing nearly a quarter of an inch from the abraded margin. The next suture is applied near the middle of the gap, and the third within a few lines of the superior angle. During their introduction, the palate is rendered somewhat tense by grasping the uvula with a pair of forceps, and as soon as the needle has transfixed the parts, it is seized at its point, drawn out, and reinserted into the instrument. The ends of each ligature are brought out at the corners of the mouth, where they are held by an assistant. When the patient is sufficiently docile, this stage of the operation is neither fatiguing, protracted, nor painful. The arrangement of the ligatures is exhibited in fig. 366.

Fig. 364.



The author's forceps.

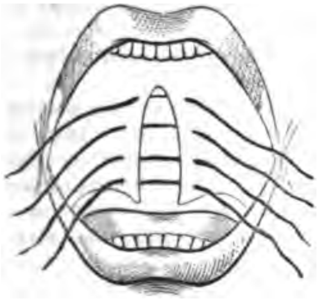
Fig. 365



Schwerdt's needle-forceps.

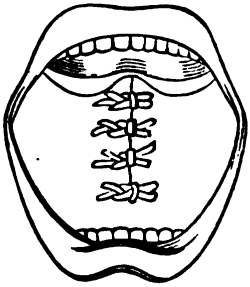
All that now remains to be done is to fasten the sutures, and this is, undoubtedly, one of the most delicate steps of the whole procedure. Taking hold of the long ends of the inferior thread, as they lie at the corners of the mouth, they are tied into a reef-knot, and cut off within a line of its surface. The other sutures are then secured successively in the same manner, the upper one being always tied last. These appearances are exhibited in fig. 367. If the ligatures have been well waxed previously to their introduction, they may generally be easily tied with the fingers alone, but when this precaution has been neglected, or the gap is inordinately wide, the loop may slip unless held with the forceps until the knot is completed. If wire be used, the ends may be fastened by torsion or with small shot. The same rules are adopted here in regard to the approximation of the edges of the fissure as in hare-lip; care being taken, on the one hand, that it is not too close, and, on the other, that it is not too slight.

Fig. 366.



Situation of the sutures in staphylorraphy.

Fig. 367.



Showing the manner in which the sutures are tied.

In paring the edges of the fissure, as well as in the subsequent steps of the operation, the sponge-mop will generally afford useful aid in clearing away blood and mucus. At least two such instruments should be at hand in every undertaking of the kind.

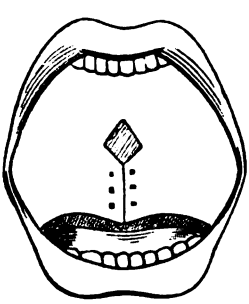
In most of the operations performed for the cure of this defect, it is necessary, as suggested by Mr. Fergusson, to divide the palato-pharyngeal and elevator muscles, on account of the resistance which they offer to the approximation of the edges of the fissure. When the chasm is unusually large, or the irritability of the palate very great, this should always be done immediately after the process of abrasion; but under opposite circumstances it may advantageously be postponed until the stitching has been done, and in the more simple forms of the affection, it may, as I know from experience, be very properly omitted altogether. The division is easily effected with the knife used for paring the edges of the fissure, the parts, if necessary, being previously put on the stretch with a pair of forceps.

When the uvula is abnormally long, it may be advantageously retrenched at the close of the operation; and occasionally I have found it convenient to stitch the opposite halves together, in order to insure their more accurate adhesion.

The operation being over, the patient sits up, or lies down, as he may find it most agreeable, absolute recumbency being rarely necessary. The great point is to keep the parts perfectly at rest; hence, talking, laughing, hawking, spitting, coughing, and sneezing, are to be most carefully avoided. The diet must be perfectly bland and simple, yet sufficiently nourishing, consisting entirely, until the adhesive process is pretty well advanced, of ice water, lemonade, thin custard, thickened milk, and soft jelly; not swallowed, but allowed to trickle down the throat, as often as the necessities of the case may seem to demand. If the resulting inflammation is so severe as to be likely to mar success, blood is taken from the arm, or by leeches from the base of the jaw, and the bowels are freely opened by enemata. The sutures are not disturbed as long as they appear to do good; generally they are not removed before the sixth day, and the inferior one often not until twenty-four hours later. If the union is imperfect, as evinced by the gaping between the sutures, either additional stitches are employed, or an attempt is made to effect closure by the gentle application of nitrate of silver. If it fail entirely, the operation is repeated, time being afforded the parts to recover from the shock and irritation of the first effort. Occasionally a small gap, as in fig. 368, remains at the upper angle of the wound, which nothing can close.

Staphylorraphy was first performed by Roux, of Paris, early in the present

Fig. 368.

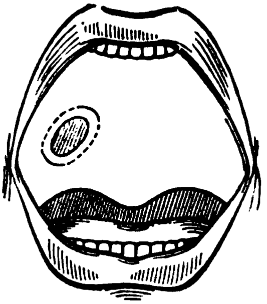


Unclosed fissure in the palate after staphylorraphy.

century, and now ranks among the established operations in surgery. In this country, the names of the two Warrens, Stevens, Hosack, Smith, Mettauer, Gibson, Mütter, Pancoast, and others, are honorably associated with it, either on account of their successful exploits, or the invention and application of useful instruments.

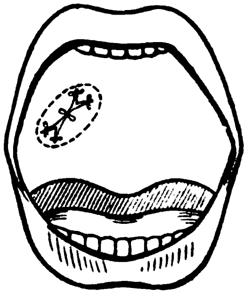
When the fissure involves the hard palate alone, it may occasionally be closed, provided it is very narrow, by dissecting up a flap of mucous membrane on each side, between the edge of the chasm and the alveolar process of the jaw, and then stitching the parts together with several points of the interrupted suture, as in the ordinary operation. A similar procedure may be necessary when the roof of the mouth has been perforated by disease or accident. Upwards of twenty years ago I performed an operation of this kind upon a young gentleman, since deceased, with the most satisfactory results. The opening was fully half an inch in diameter, and the union was perfect in less than a week. Dr. J. M. Warren, to whom the credit of devising the operation is usually ascribed, has also performed it successfully. The nature of the procedure will readily be understood by a reference to figs. 369 and 370.

Fig. 369.



Fissure of the hard palate.

Fig. 370.



Fissure of the hard palate, closed by suture.

The acquisition of the power of speech after staphylorraphy is generally very slow; a circumstance of which the patient and his friends should be fully apprised beforehand, otherwise it may lead to sad disappointment and even reproach. Much may be done, in every case, by a regular, systematic course of training, persisted in, if necessary, for several years.

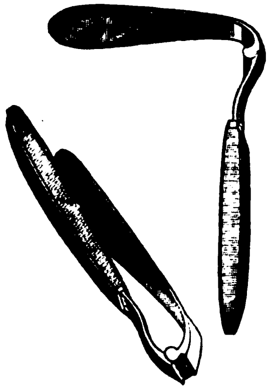
No *statistics*, on an extensive scale, have been published of this operation. Mr. Fergusson, in June, 1862, stated that he had performed it, up to that period, in 105 cases, only 3 of which had been unsuccessful. A few instances have been recorded in which the operation proved fatal.

SECT. V.—AFFECTIONS OF THE TONSILS.

The diseases of the tonsils are few and simple, consisting mainly of inflammation and hypertrophy. Scirrhus and encephaloid have been noticed in them, but never, or, at all events, very rarely, as independent affections. In nearly all the recorded cases of which I have any knowledge, they were associated with similar formations in other parts of the body.

To obtain a good view of these bodies, the patient is seated in a strong light, the mouth being opened as widely as possible, and the tongue depressed with a book-folder, a wooden spatula, the handle of a spoon, or, what I generally prefer, a common grooved director. In chronic disease, the latter instrument may be advantageously used for uncovering the affected parts, by lifting off the anterior arch of the palate, and also for ascertaining the degree of their consistence. Holding the tongue perfectly quiet, while the patient is taking a long inspiration, will bring the tonsils fully into view, and at the same time prevent the unpleasant retching so liable to follow the contact of a foreign substance. When the tongue is unusually unmanageable, as it often is in children, and even in adults, the best depressor is the one represented in fig. 371. The instrument, depicted in fig. 253, and invented by Dr. Church, of New York, will be found to be of great assistance in tedious operations about the mouth, or when it is necessary to make unusually careful examinations of the throat, depressing not only the tongue, but also separating the jaws.

Fig. 371.



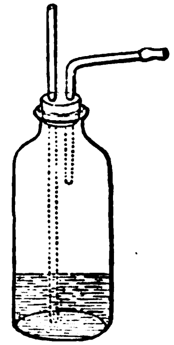
Tongue depressor.

In acute as well as in chronic affections it is often necessary to bring our remedies in immediate contact with the tonsils, gargling, as it is called, being in most cases either ineffectual, or wholly inadmissible. The articles most commonly employed are the tincture of iodine and nitrate of silver, either in substance or solution. Lotions, of whatever description, should be applied by means of a mop, consisting of a piece of soft sponge, about four lines in diameter, and secured to the end of a thin cylinder of wood, eight inches long. The sponge, being thoroughly wet, but not distended, with the fluid, and the tongue depressed in the manner above directed, is passed down into the throat, and pressed gently, but effectually, against every portion of the suffering surface, not only of the tonsils, but of the uvula and the arches of the palate, which generally participate in the disease. Solid substances, as sulphate of copper and nitrate of silver, are best applied in a long quill, or special carrier, the end being previously rounded off with a wet cloth.

Medicines may occasionally be advantageously applied, in the form of dry powder, directly to the inflamed mucous surface, by a process of *insufflation.* Experience shows that excellent effects may be obtained even when the substance cannot be brought in immediate contact with the affected part, as in the case of the larynx and trachea, the morbid action being apparently relieved by the sympathetic impression produced by depositing the remedy in the vicinity of the disease. The best means of applying dry powder is an insufflation tube, slightly curved at the distal extremity, which should be perforated with numerous little apertures. The most desirable articles for the purpose are alum, borax, tannin, nitrate of silver, and hydrochlorate of ammonia, either alone, or, what will generally be better, mixed with loaf sugar. The operation must not be too frequently repeated.

The *inhalation* of the vapor of hot water, either simple or medicated, may often be used with immense benefit in affections of the tonsils, palate, fauces, larynx, and Eustachian tubes, and may readily be accomplished with a very cheap and simple apparatus, as that, for example, represented in fig. 372. The materials of which it consists are, a large glass bottle with a wide mouth, a soft, closely-fitting cork, and two glass tubes, the one straight, and intended to convey the external air below the surface of the liquid, the other curved, and intended to serve as a mouth-piece, or as an inhaler, properly so called. The articles commonly used for medicating the water are laudanum, spirits of camphor, creasote, guaiacum, and iodine, the latter two in the form of tincture.

Fig. 372.



Inhaler.

Scarification of the tonsils is occasionally performed for the relief of inflammatory engorgement. The operation is effected by drawing a sharp bistoury, guarded to within a line of its point, rapidly across the mucous membrane in half a dozen different directions. Discharge is encouraged by gargling freely with warm water. If clots form in the incisions, they are removed with the mop, finger, or director. Scarification of the tonsils and palate, although a favorite practice with some, has usually disappointed my expectations, and I, therefore, seldom employ it, except when there is inordinate œdema of the submucous cellular tissue. Even in such cases, however, more prompt relief will generally follow the application of the dilute tincture of iodine, or a strong solution of nitrate of silver. When the swelling is great and urgent, a few tolerably deep incisions will be advantageous.

1. *Acute Tonsillitis.*—Acute inflammation of the tonsils is exceedingly common, especially in young persons of a delicate, strumous constitution, and is often induced by the most trivial causes, of which the most frequent is exposure to cold. It occurs at all periods of life, in both sexes, and at all seasons of the year, being most common, however, in winter and spring. The attack is generally rather sudden, and is apt, if unchecked, to proceed with considerable rapidity. To a sense of soreness and stiffness in the throat, with a disagreeable, but indescribable, feeling, which marks the stage of invasion, are soon superadded great difficulty of swallowing, severe pain, and a constant desire to clear the fauces of mucus, which is always very ropy, adhesive, and abundant, and the effort to detach which constitutes a source of real suffering. The pain soon extends to the face, ears, and neck, and, the mechanical obstruction increasing, the breathing becomes much embarrassed, sometimes, indeed, almost to the extent of suffocation. If the patient attempts to drink, the fluid regurgitates by the nose, and often nearly strangles him; his head is thrown backwards, in order that the mouth and larynx may be brought more into a straight line; and, during sleep, he snores with a loud noise. The lymphatic ganglions, at the base of the jaw, are frequently swollen and tender; and there are few cases of any severity in which there is not high fever. On inspecting the mouth, which is often done with great difficulty, the tonsils are found to be very much enlarged, and of a deep, almost fiery red color, with here and there a speck, patch, or streak of firmly adherent lymph. From its peculiar color and shape, this substance frequently gives the glands an ulcerated appearance; but a careful examination soon serves to dispel the illusion. The arches of the palate, uvula, fauces, and root of the tongue, always participate in the morbid action, being red, tumid, and painful. Generally both tonsils are involved, though seldom in the same degree.

The *treatment* of acute tonsillitis is by antiphlogistics, early and vigorously employed, and persisted in until there is decided abatement of morbid action. When robustness of the system obtains, blood is taken by a large orifice from the arm, and by leeches from the neck, directly opposite the inflamed organs; the bowels are thoroughly evacuated; and, if there is much mechanical obstruction, a brisk emetic is administered. When the disease is very mild, or in its inception, prompt relief generally follows the use of the foot-bath, a full dose of Dover's powder, and the wet towel round the neck. In violent cases, besides the means already mentioned, scarification and even incision may be required, to remove tension and vascular engorgement. As to gargles, little reliance is to be placed upon any of them in any form of the disease, or in any of its stages, owing to the difficulty of bringing them in contact with the inflamed surfaces. When such remedies are indicated, it will always be better to mop the parts well with the dilute tincture of iodine, or to touch them very gently with the solid nitrate of silver. The former application is particularly beneficial in the œdematous variety of tonsillitis, in which it often acts like a charm in relieving the mechanical obstruction caused by effused fluids. The proper proportions, except in young children and very delicate persons, are equal parts of the tincture and of alcohol. One application frequently suffices, but sometimes several are required, at intervals of ten or twelve hours. When the inflammation is diffuse and urgent, warm applications to the neck, in the form of thick cataplasms, will be serviceable.

When the tumefaction is very great, the tonsils may nearly fill up the fauces, and encroach so much upon the epiglottis as to interfere materially with respiration. In such an emergency, prompt relief must be afforded, or the patient may perish from suffocation. The plan to be pursued is to excise a portion of the affected glands at the middle line; or, this failing, to open the larynx. To let a man die from such a cause is hardly less criminal than to kill him. If the operation is delayed too long, death may occur from the shock sustained by the system, in consequence of the struggles to maintain the respiratory functions.

2. *Gangrene.*—Gangrene of the tonsils is most frequently met with in connection with scarlatina, smallpox, and syphilis; as an event of ordinary inflammation, it is extremely rare. A fetid state of the breath, a foul, livid appearance of the affected glands, and a dark, sanious discharge from the throat, with difficulty of deglutition, severe pain, and high fever, are the characteristic symptoms. The surrounding structures, as the uvula and arches of the palate, usually participate in the mischief, exhibiting similar appearances, and augmenting the suffering. The treatment, as a general rule, is by stimulants; by brandy and quinine internally, and by the acid nitrate of mercury, nitrate of silver, or sulphate of copper locally. If the gangrene has been induced by syphilis, for which a course of mercury has been employed, the remedy is at once suspended, lest the destructive process be fostered instead of being diminished.

3. *Ulceration.*—Ulcers, both common and specific, are liable to occur in the tonsils, or in these organs, the palate, and the fauces. The former are rare, and are usually produced by derangement of the digestive apparatus; they are small, irregular, superficial, and associated with a reddish, flabby condition of the throat, with a tendency to the formation of aphthæ or plastic deposits. Removal of the exciting cause, with purgatives and alterants, is generally sufficient for their cure; aided, if necessary, by light applications of nitrate of silver. Of the venereal ulcer of the tonsils there are several varieties, as the excavated, the diphtheritic, and phagedenic; but, as these are described in the first volume, no particular account of them is required here.

4. *Abscess.*—Acute tonsillitis now and then terminates in abscess; the matter is seldom abundant, but often very offensive, and the symptoms are usually very urgent, from the mechanical obstruction caused by the inflamed and tumefied organs. The formation of pus is generally ushered in by an aggravation of the local and constitutional distress, as throbbing pain, livid discoloration of the mucous membrane, and rapid increase of swelling, together with rigors and high fever. On looking into the mouth, the tonsils, especially if both suffer in an equal degree, are found to touch each other at the middle line, leaving, perhaps, merely a small interval at their upper extremity, which is itself often nearly entirely closed by the enlarged and pendulous uvula. The patient breathes with immense difficulty, and appears as if he were in imminent danger of suffocation. The matter generally forms within the first five days after the commencement of the attack, and, in rare cases, even considerably earlier. It may appear simultaneously in both glands, or be limited to one.

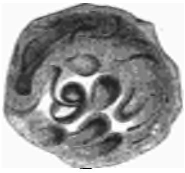
The *treatment* is rigorously antiphlogistic; and spontaneous evacuation, which might permit the matter to fall into the larynx, and so cause suffocation, is anticipated by early and free incision. A long, straight, sharp-pointed bistoury, wrapped to within the third of an inch of its extremity, is passed into the mouth, with the back towards the tongue, until it reaches the swelling, into the centre of which it is thrust with the requisite degree of force, the opening being afterwards enlarged to the desired extent by inclining the instrument over towards the middle line. The head of the patient is held firmly by an assistant, lest he should push it forwards or to either side, and so endanger the internal carotid artery. For the same reason, the knife is kept away from the angle of the jaw. In the natural state, the tonsil is at least five or six lines from this vessel; but, when the gland is much tumefied, the distance between them is sensibly diminished. Smart bleeding, from the division of the tonsillary artery, occasionally follows the operation, and is generally decidedly advantageous in allaying inflammation [illegible] ceases in a few [illegible] [illegible] margins.

5. [illegible] —Hypertrophy of the [illegible] sented [illegible] exceedingly common [illegible] young [illegible] peated [illegible] age, and [illegible] under [illegible] to believe [illegible] having been [illegible] birth. It [illegible] thirtieth year [illegible] life, and [illegible] persons are [illegible] its history and [illegible] is always of a [illegible] with equal [illegible] sexes.

Enlarged tonsils.

The disease [illegible] although both [illegible] they seldom suffer [illegible] generally speaking, they enlarge in every direction, and [illegible] more or less upon the surrounding parts, as the base of the [illegible] and Eustachian tubes. Not unfrequently they touch [illegible] line, leaving, perhaps, merely a small chink above and [illegible] the air. Their color and consistence are liable to [illegible] young subjects they are usually quite red, and so soft as [illegible] slightest pressure and traction. At this age, I have [illegible] peculiar foliaceous arrangement of the gland, its substance [illegible] distinct strata, of a red color, very vascular, and remarkably friable. [illegible] of long standing, and, indeed, as a general rule, the organs are of a [illegible] complexion, and of a tough, firm consistence. At other times, again, this is rare, they are almost of scirrhous hardness. Their follicles, [illegible] much enlarged, often contain plugs of lymph, [illegible] mucus, curdy matter, or calcareous concretions. [illegible] very patulous, they impart to the surface of the hypertrophied tonsil an appearance similar to that of the [illegible] pepper-box, as seen in fig. 374, from a clinical case. [illegible] shape of the gland is generally irregularly elongated, now and then almost globular. The uvula, the arches of the palate, and the mucous membrane of the fauces, [illegible] invariably participate in the diseased action.

Fig. 374.


Hypertrophy of the tonsil.

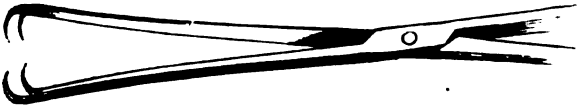
It is questionable whether the tonsils would ever [illegible] from chronic enlargement, or, at any rate, remain long in this condition, if there were not always a constitutional predisposition to its occurrence. The affection, as has already been remarked, is mostly of a strumous character. Hence, the most trivial circumstance, as exposure to cold, suppression of the cutaneous perspiration, or derangement of the digestive apparatus, is generally sufficient to provoke it. The frequent recurrence of the act maintains and re-excites the inflammation and the effusion of lymph which are the immediate causes of the enlargement and induration from which the affection derives its distinctive features. Whether there is often a deposit of tubercular matter in the hypertrophied organs has not been demonstrated; but that the enlarged follicles occasionally contain a substance of this description, or of one very closely resembling it, the results of my examinations abundantly attest.

Enlargement of the tonsils, unless considerable, is not necessarily attended with any unpleasant *symptoms*; the only inconvenience experienced being, perhaps, a sense of fulness and occasional soreness in the throat. These effects ar[illegible] invariably aggravated when the patient takes cold, or labors under derangement of the general health. In the more confirmed forms of hypertrophy, however, the local suffering is always proportionately great, from the mechanical obstruction from the enlarged glands. The voice is husky, nasal, and disagreeable; the respiration is impeded; and there is an uneasy feeling in the throat, with a remarkable tendency to inflammation. When the tonsils are so large as to be almost in contact with each other, the distress is greatly augmented. During sleep a low moaning is usually present, accompanied with snoring and stertorous breathing, and the head is strongly retracted, so as to bring the mouth on a line with the windpipe, evidently for the purpose of facilitating the ingress of the air. In cases of very long standing, distortion of the features is apt to arise; the nostrils are habitually dilated; the mouth is half open; and the whole countenance has a dull, vague expression. Partial deafness, from obstruction of the Eustachian tube, occasionally exists; and the chest is liable to become arched behind, flattened in front, and contracted at the sides. This deformity is sometimes present in a surprising degree at an early period of life. I have seen several well-marked examples of it in children under six years of age.

A great variety of means have been tried for arresting the progress of this affection, and for promoting the absorption of the interstitial deposits, so as to restore the glands to their primitive condition. Very few of them, however, are found to have the desired effect, especially when the disease is fully established. The remedies most worthy of reliance are iodine and kindred articles, administered internally, and applied to the affected parts. The tincture of iodine, with an equal quantity of alcohol, and a weak solution of the iodide of iron, applied once every other day by means of a soft mop, are both valuable sorbefacients, and may occasionally be used with advantage. Nitrate of silver is also beneficial, especially in its fluid form. The proper strength, in children, is from fifteen to twenty grains of the salt to the ounce of water; in adults, it should be at least double. Numerous and repeated punctures with the point of a delicate bistoury have sometimes been attended with good results in my hands: they serve to disgorge the capillary vessels, and to promote the absorption of effused lymph; two most important indications in the treatment. Frequent compression of the enlarged gland with the finger has been suggested; but the trials that I have made with it have disappointed my expectations. With these means may be conjoined, sometimes with advantage, the application of leeches, embrocations, and stimulating unguents to the neck. In all cases, due attention is paid to the state of the general system; the diet is carefully regulated; the bowels are maintained in a soluble condition; and, when there is any evidence of debility, tonics, especially iron and quinine, are freely exhibited.

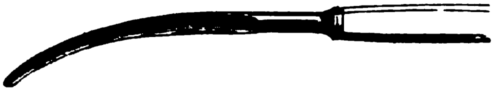
The above treatment failing, as, unfortunately, it is too apt to do, the only way of getting rid of the difficulty is to excise a portion of the enlarged bodies, so as to enable the air to enter the lungs with its accustomed freedom. The operation performed with this view consists in seizing each gland with a double hook, fig. 375, and cutting off all that part of it which lies exterior to the arches of the

Fig. 375.



Volsella.

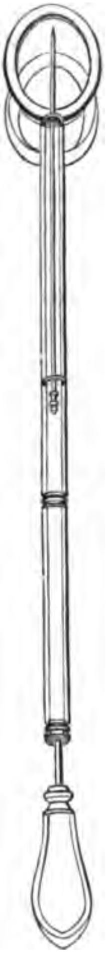
Fig. 376.



Probe-pointed bistoury.

palate with a curved, probe-pointed bistoury, seen in fig. 376. The instrument is carried from below upwards, with the back towards the tongue, excision being effected almost in an instant, with hardly any pain or hemorrhage. The hook and knife, with which it is my custom to perform the operation, and which are here represented, are altogether superior to the tonsillotomes of Physick, Gibson, Fahnestock, and other surgeons. They are each about eight inches in length. The great objection to the tonsillotome is that the ring, at its distal extremity, is rarely sufficiently large to receive the hypertrophied gland in its embrace, so as to allow us to cut off as much as is necessary. In children I have occasionally used the instrument with excellent effect. The neatest tonsillotome is that of Fahnestock, represented in fig. 377. When both tonsils require removal, and the surgeon is not ambidextrous, the operation may be performed very easily with the right hand.

Fig. 377.



Fahnestock's tonsillotome.

Excision of the tonsils is simple enough in the adult, but in the child it is often attended with immense difficulty, on account of his cries and struggles. Indeed, there are few operations which, under such circumstances, are more annoying and perplexing than this. To overcome this difficulty the best plan is to wrap up the child firmly in an apron and to have him well supported by assistants; or, what I prefer, to administer a small quantity of chloroform, just enough to produce partial insensibility. In this manner one tonsil being removed, the little patient is allowed time to clear his throat, when, the agent being again inhaled, the operation is completed by excising the other. The best depressor of the tongue is the surgeon's index finger. The interposition of a piece of cork between the teeth is usually an awkward and unnecessary proceeding.

The operation above described, although generally free from hemorrhage, is not so always. In 1849 I performed it upon a boy, aged eleven years, in whom the bleeding was not only copious, but absolutely alarming. Both tonsils were much enlarged, and were accordingly excised; the right bled hardly any, but from the left the blood issued at numerous points, and was spat up every few seconds in large mouthfuls. Much also was swallowed, and afterwards ejected by vomiting. The entire quantity amounted, I am satisfied, to nearly twenty ounces. The boy, although for a short time very pale, feeble, and nauseated, soon recovered from the effects of the operation. The remedies used for arresting the hemorrhage were, first, sulphate of copper, and afterwards powdered alum, applied freely by means of a sponge-mop, ice to the neck, and a full dose of laudanum, with thorough elevation of the head, and exposure of the mouth and body to a current of cold air. The lad slept well the following night, without any recurrence of the bleeding. There was no evidence of a hemorrhagic diathesis. An equally remarkable case of bleeding from excision of one of the tonsils fell, many years ago, under the observation of a former colleague of mine, Professor Cobb, in a youth of fourteen. The portion of gland removed did not exceed the volume of a pigeon's egg, and yet the flow of blood was so copious as almost to induce syncope.

Since the publication of the first edition of this work, I have met with two other cases of severe bleeding after this operation; one in a youth of eighteen, and the other in a man of thirty, neither of them presenting anything peculiar prior to the excision. The hemorrhage in both was quite copious, but finally yielded to the application of the tincture of the chloride of iron, along with a full anodyne. The man lost upwards of a quart of blood

When the hemorrhage proceeds from the division of the tonsillary artery, it may be necessary, in the event of the failure of styptics, to seize and compress the bleeding orifice with a light pair of forceps, retained temporarily in the mouth. Erichsen refers to a case in which the hemorrhage was effectually arrested, after the failure of all other means, by a gargle of spirits of turpentine suspended in mucilage.

Prudence dictates the propriety, after removal of the tonsils, of confining the patient for several days to a moderately warm apartment; at all events, he should avoid the cold air, and, if necessary, on account of the severity of the resulting inflammation, take an active cathartic. For want of this precaution several lives have been lost that might otherwise have been saved.

6. *Calculous Concretions.*—Calculous concretions, varying in size from that of a mustard seed to that of a small cherry, and of a rounded, oval, or pyriform shape, are sometimes seen in the tonsils, chiefly in strumous subjects, and in connection with chronic inflammation, which they are instrumental in aggravating and keeping up. They are of a dirty olive color, granulated on the surface, opaque, cretaceous in their consistence, and composed principally of carbonate and phosphate of lime, in union with animal matter. Their presence is generally detected accidentally. If allowed to remain, they are liable to provoke suppuration of the tonsils, attended with great local and constitutional suffering. A slight incision is usually sufficient to effect their liberation. When they protrude at the orifice of a mucous crypt, they may easily be extracted with a polyp-forceps.

7. *Serous Cysts.*—The tonsil is occasionally, though very rarely, the seat of a serous cyst, filled with a thin, watery fluid, or a thick, ropy substance, resembling the white of an egg. The tumor is usually small, and may be suspected to exist when the gland has a whitish, translucent appearance, with a sense of fluctuation on the application of the finger. No pain attends its formation, and the only inconvenience which it produces arises from its mechanical obstruction. The treatment is by incision, followed by the application of nitrate of silver, tincture of iodine, or chromic acid.

8. *Polyps.*—The tonsils are now and then the seat of a fibrous polyp. A case of this kind came under my observation, not long ago, in a man, aged thirty-five years, affected with chronic asthma. The tumor, which was of a whitish aspect, and of the shape of the kidney, was very firm and dense, of a fibrous structure, three lines in length, and attached, by a hard, narrow pedicle, about the twelfth of an inch long, to the centre of the right tonsil, which was otherwise apparently quite sound. The man had not been aware of the presence of the tumor until its removal.

9. *Chronic Abscess.*—A chronic abscess sometimes forms in the tonsils, evidently as a result of the strumous diathesis. It generally occurs in young persons, in association with tuberculosis of the lungs. The abscess, which is always very tardy in its progress, and free from pain, seldom exceeds the volume of a pigeon's egg, and may generally be easily recognized by the whitish, grayish, or drab-colored aspect which it imparts to the surface of the gland. Its contents are characteristic. The proper remedy is free incision.

10. *Malignant Disease.*—Scirrhus and encephaloid have been observed in these bodies, but so rarely as hardly to deserve even passing notice. They commonly coexist with similar deposits in other organs, pursue the same course, are characterized by similar phenomena, and are equally uncontrollable by treatment. Surgical interference is only justifiable when the gland acts obstructingly to respiration and deglutition, with a hope of very brief amelioration. I am not aware that melanosis or colloid has ever been witnessed in this situation; certainly not as independent affections.

SECT. VI.—AFFECTIONS OF THE UVULA.

The principal affections of this body are acute inflammation and chronic enlargement. In the former, which generally coexists with acute disease of the tonsils and palate, the organ is swollen, and of a fiery red, or pale ash color, elongated, and œdematous. Its free extremity is sometimes expanded into a kind of watery bag, which, especially if there is at the same time great tumefaction of the tonsils, [illegible] the promptest inter[illegible] [illegible] effectually with the [illegible] [illegible] and capsicum. When [illegible] scarification may be required, [illegible]

[illegible] causes, is liable to chronic [illegible] varies in extent from [illegible] length. An increase [illegible] although not [illegible] narrow and tapering [illegible] period of life, but is most [illegible] generally the result of [illegible] and feeble constitution. It [illegible] tonsils, and fauces, derange[illegible]

[illegible] elongated uvula. Thus the [illegible] occasioning aphonia, [illegible] and a sense of strangulation. I [illegible] attacks of nightmare from the [illegible] a portion of this organ. The [illegible] irritated cough, with frequent [illegible] of the mucous mem[illegible] When the affection [illegible] and the patient ultimately [illegible]

[illegible] effects from mere relaxation [illegible] disease of its own sub[illegible] into the fauces, and thereby [illegible] of the tongue in the same [illegible] of things is very common in dis[illegible] constitutes a source of great [illegible]

[illegible] of the uvula. All astringent [illegible] and, therefore, no time should [illegible] upon a chair, opposite a [illegible] and with a polyp-forceps seize [illegible] with a pair of probe-pointed sc[illegible] Not more than about one-third of an inch [illegible] the elongation may ultimately be re[illegible] operation. In a few instances I have removed [illegible] without, so far as could be discovered, producing any [illegible] effects. It has been asserted that, when the excision is performed near the base of the uvula, there will occasionally be a serious change in the voice, but of this I have never seen an example. If I were obliged to operate upon a professed singer, I should certainly limit myself to the removal of a very small portion of the elongated organ, lest unpleasant consequences of this nature might arise. The operation, as above advised, is so simple that any one may perform it. No hemorrhage need be looked for, nor is the excision attended with any pain. The diet for the first few days must be chiefly liquid.

SECT. VII.—AFFECTIONS OF PHARYNX AND ŒSOPHAGUS.

The exquisite sensibility of the palate renders it often extremely difficult, if not impossible, to make a satisfactory examination of throat, with a view to the detection and treatment of its diseases. The moment the parts are touched they contract spasmodically, and excite a tendency to vomiting, attended with such a degree of constriction as effectually to stop the proceeding. This sensibility, which is natural to all persons, is frequently greatly heightened by disease, and can, in general, be overcome only by a systematic course of training, or by the exhibition of an anæsthetic. Commonly, a sufficiently good view may be obtained by requesting the patient to take a long inspiration; but even this cannot always be done by a nervous individual, and the surgeon is then obliged to depress the tongue, and explore the parts as best he may. When more than ordinary care is required, recourse must be had to the *pharyngoscope*. A very excellent instrument of this kind, invented by Dr. Simrock, is delineated at p. 235. It is simply a modification of that of Semeleder, and answers the double purpose of a rhinoscope and pharyngoscope. In cloudy weather, the parts may be illuminated with an Argand lamp, or a Levin's lantern, by means of which the light may be retained, and transmitted through a strong convex lens. The uvula, palate, and tonsils may be held out of the way during the inspection with a hook, spatula, or large probe.

The affections of these two tubes, which, in structure and function, are intimately associated, may conveniently be considered together. The most common and important of them are, inflammation, abscess, wounds, strictures, malignant growths, and foreign bodies.

1. *Pharyngitis.*—Inflammation of the pharynx occasionally exists as an independent affection; but, in general, it is associated with, or a consequence of, disease of the palate and tonsils. It may be the result of ordinary causes, as suppression of the cutaneous perspiration, or the lodgment of a foreign body; or it may be induced by the syphilitic poison, by a strumous taint of the system, or by the contact of an erosive substance, as nitric, sulphuric, or hydrochloric acid. The inhalation of steam and the swallowing of hot water are often followed by intense inflammation, both of the pharynx and œsophagus.

The *symptoms* of the disease will be more or less urgent, according to the violence and duration of the morbid action. Impediment in deglutition, a frequent desire to clear the throat, and a copious secretion of thick, ropy mucus are, in general, the most conspicuous phenomena. In the more severe forms of the disease, the patient often experiences severe pain and spasm, especially in his attempts to swallow liquids, which frequently regurgitate by the mouth and nose; the voice is hoarse and croaking; and there is occasionally not a little embarrassment in breathing, from an extension, apparently, of the inflammation to the windpipe. Considerable swelling, chiefly of a glandular nature, sometimes exists in the neck, along the base of the jaw, and in the gutter below the ears. The lining membrane of the pharynx is of a deep-red color, its follicles are much enlarged, and its surface is covered with thick, ropy mucus, and, here and there, even with plastic matter. In severe cases, the inflammation extends up into the nose, forwards over the palate, and down into the larynx. The constitutional symptoms vary with the intensity of the local action, and need not, as they exhibit no peculiarities, be described.

The *treatment* is antiphlogistic; by the lancet and antimonials, if there is much local and constitutional excitement, along with purgatives, diaphoretics, and anodynes, and by leeches to the neck, with tepid, acidulated gargles, scarification, especially if the inflamed surface is within reach, and the application of nitrate of silver, either in substance or strong solution. When the tube is loaded with ropy mucus, attended with a frequent desire to clear the throat, great relief will follow an emetic. Warm applications to the neck, in the form of poultice or fomentation, and the inhalation of the steam of warm water, are occasionally beneficial. If gangrene is threatened, the parts are promptly and efficiently touched with nitrate of silver, or, what is preferable, a weak solution of acid nitrate of mercury.

2. *Abscess.*—An abscess, generally of a strumous nature, occasionally forms in the upper part of the pharynx, beneath the mucous membrane in front of the cervical vertebræ, which are often involved in the morbid action. The disease is usually very stealthy in its mode of invasion, and tardy in its progress, there being commonly an entire absence of the ordinary symptoms of inflammation. The first circumstance, perhaps, that attracts attention is slight impediment in deglutition and breathing, with an inclination to snore, and to sleep with the mouth open. Upon looking into the throat, a tumor is detected, bulging forwards

often alarmingly obstructs respiration, and necessitates the promptest interference. The treatment consists in touching the part effectually with the dilute tincture of iodine, nitrate of silver, or powdered alum and capsicum. When the enlargement is excessive, or decidedly œdematous, scarification may be required, or even excision of the free extremity of the organ.

The uvula, from debility, inflammation, and other causes, is liable to chronic enlargement, especially to elongation. The elongation varies in extent from the slightest increase of the part to several times the normal length. An increase of length is usually associated with an increase of thickness, although not necessarily so, for an elongated uvula is occasionally remarkably narrow and tapering. Chronic enlargement of this organ may occur at any period of life, but is most common in young and middle-aged subjects, and is generally the result of repeated attacks of cold, operating upon a delicate and feeble constitution. It is usually conjoined with inflammation of the palate, tonsils, and fauces, derangement of the digestive apparatus, and a strumous diathesis.

Very disagreeable effects may be produced by an elongated uvula. Thus, the affected organ may project down into the rima of the glottis, occasioning aphonia, or a change in the tone and power of the voice, and a sense of strangulation. I recollect one case where the patient had repeated attacks of nightmare from this cause, which were promptly cured by excising a portion of this organ. The more common effects, however, are obstinate and protracted cough, with frequent desire to clear the throat, titillation of the fauces, dryness of the mucous membrane, and a feeling of constriction and frequent hawking. When the affection continues long, tubercles sometimes form in the lungs, and the patient ultimately dies under all the symptoms of confirmed phthisis.

The uvula is occasionally productive of disagreeable effects from mere relaxation of the soft palate, independently of any particular disease of its own substance. The palate, thus affected, hangs down into the fauces, and thereby permits the organ to infringe upon the larynx and root of the tongue in the same manner as in real elongation. Such a state of things is very common in dyspeptic and consumptive subjects, in whom it often constitutes a source of great annoyance.

The proper remedy for this affection is *excision* of the uvula. All astringent lotions, washes, and gargles are perfectly useless, and, therefore, no time should be wasted in their employment. The patient sitting upon a chair, opposite a good light, the surgeon depresses the tongue, and with a polyp-forceps seizes the apex of the uvula, which is then cut off with a pair of probe-pointed scissors, slightly curved upon the flat. Not more than about one-third of an inch of the organ should be left, otherwise the elongation may ultimately be reinduced, and so demand another operation. In a few instances I have removed nearly the whole of this body, without, so far as could be discovered, producing any injurious effects. It has been asserted that, when the excision is performed near the base of the uvula, there will occasionally be a serious change in the voice, but of this I have never seen an example. If I were obliged to operate upon a professed singer, I should certainly limit myself to the removal of a very small portion of the elongated organ, lest unpleasant consequences of this nature might arise. The operation, as above advised, is so simple that any one may perform it. No hemorrhage need be looked for, nor is the excision attended with any pain. The diet for the first few days must be chiefly liquid.

SECT. VII.—AFFECTIONS OF PHARYNX AND ŒSOPHAGUS.

The exquisite sensibility of the palate renders it often extremely difficult, if not impossible, to make a satisfactory examination of throat, with a view to the detection and treatment of its diseases. The moment the parts are touched they contract spasmodically, and excite a tendency to vomiting, attended with such a degree of constriction as effectually to stop the proceeding. This sensibility, which is natural to all persons, is frequently greatly heightened by disease, and can, in general, be overcome only by a systematic course of training, or by the exhibition of an anæsthetic. Commonly, a sufficiently good view may be obtained by requesting the patient to take a long inspiration; but even this cannot always be done by a nervous individual, and the surgeon is then obliged to depress the tongue, and explore the parts as best he may. When more than ordinary care is required, recourse must be had to the *pharyngoscope*. A very excellent instrument of this kind, invented by Dr. Simrock, is delineated at p. 235. It is simply a modification of that of Semeleder, and answers the double purpose of a rhinoscope and pharyngoscope. In cloudy weather, the parts may be illuminated with an Argand lamp, or a Levin's lantern, by means of which the light may be retained, and transmitted through a strong convex lens. The uvula, palate, and tonsils may be held out of the way during the inspection with a hook, spatula, or large probe.

The affections of these two tubes, which, in structure and function, are intimately associated, may conveniently be considered together. The most common and important of them are, inflammation, abscess, wounds, strictures, malignant growths, and foreign bodies.

1. *Pharyngitis.*—Inflammation of the pharynx occasionally exists as an independent affection; but, in general, it is associated with, or a consequence of, disease of the palate and tonsils. It may be the result of ordinary causes, as suppression of the cutaneous perspiration, or the lodgment of a foreign body; or it may be induced by the syphilitic poison, by a strumous taint of the system, or by the contact of an erosive substance, as nitric, sulphuric, or hydrochloric acid. The inhalation of steam and the swallowing of hot water are often followed by intense inflammation, both of the pharynx and œsophagus.

The *symptoms* of the disease will be more or less urgent, according to the violence and duration of the morbid action. Impediment in deglutition, a frequent desire to clear the throat, and a copious secretion of thick, ropy mucus are, in general, the most conspicuous phenomena. In the more severe forms of the disease, the patient often experiences severe pain and spasm, especially in his attempts to swallow liquids, which frequently regurgitate by the mouth and nose; the voice is hoarse and croaking; and there is occasionally not a little embarrassment in breathing, from an extension, apparently, of the inflammation to the windpipe. Considerable swelling, chiefly of a glandular nature, sometimes exists in the neck, along the base of the jaw, and in the gutter below the ears. The lining membrane of the pharynx is of a deep-red color, its follicles are much enlarged, and its surface is covered with thick, ropy mucus, and, here and there, even with plastic matter. In severe cases, the inflammation extends up into the nose, forwards over the palate, and down into the larynx. The constitutional symptoms vary with the intensity of the local action, and need not, as they exhibit no peculiarities, be described.

The *treatment* is antiphlogistic; by the lancet and antimonials, if there is much local and constitutional excitement, along with purgatives, diaphoretics, and anodynes, and by leeches to the neck, with tepid, acidulated gargles, scarification, especially if the inflamed surface is within reach, and the application of nitrate of silver, either in substance or strong solution. When the tube is loaded with ropy mucus, attended with a frequent desire to clear the throat, great relief will follow an emetic. Warm applications to the neck, in the form of poultice or fomentation, and the inhalation of the steam of warm water, are occasionally beneficial. If gangrene is threatened, the parts are promptly and efficiently touched with nitrate of silver, or, what is preferable, a weak solution of acid nitrate of mercury.

2. *Abscess.*—An abscess, generally of a strumous nature, occasionally forms in the upper part of the pharynx, beneath the mucous membrane in front of the cervical vertebræ, which are often involved in the morbid action. The disease is usually very stealthy in its mode of invasion, and tardy in its progress, there being commonly an entire absence of the ordinary symptoms of inflammation. The first circumstance, perhaps, that attracts attention is slight impediment in deglutition and breathing, with an inclination to snore, and to sleep with the mouth open. Upon looking into the throat, a tumor is detected. bulging forwards

into the fauces, of a reddish, livid, or purplish color, irregular in form, and imparting a distinct sense of fluctuation under the pressure of the finger. The matter is of a scrofulous character, and everything about the disease is denotive of this peculiar action. In the advanced stage of the affection, there is often caries of the superior cervical vertebræ, and ulceration of their connecting cartilages. The contents of this variety of abscess occasionally disappear spontaneously, under the influence of sorbefacient remedies, or nature's unassisted efforts; but, in general, they require to be let out artificially, and the sooner this is done the better, as their long retention cannot fail to exert an injurious influence upon the surrounding parts. To perfect the cure, a course of anti-strumous treatment should be instituted, and persisted in until the desired object is attained.

A *phlegmonous abscess* sometimes forms in this situation, giving rise to violent local distress, as well as severe constitutional disturbance. The symptoms are bold and well marked. The pain is deep seated and pulsatile, the parts are red and intensely inflamed, the difficulty of swallowing is very great, the breathing is much embarrassed, and the patient is unable to lie down. The swelling, which is easily seen and felt, should be punctured at the earliest possible moment to prevent death from suffocation, which, if the case is neglected or misunderstood, will be almost certain to happen from the pressure of the matter upon the glottis or its sudden escape into the air-passages.

3. *Diphtheritis.*—There is a form of inflammation of the pharynx to which the term pseudo-membranous is applied, as it is characterized by a deposit of plastic matter upon the free surface of the mucous membrane. It is very common in certain localities of Europe, particularly at Paris, where it often prevails as an epidemic, sometimes spreading over considerable districts. It is supposed by many to be infectious, inasmuch as it now and then runs through entire families; and is most frequently met with in weakly, ill-fed children, between the second and tenth year. As an accidental disease, it is occasionally noticed in smallpox, scarlatina, measles, and typhoid fever.

The plastic matter appears either as a continuous membrane, spread over the surface of the pharynx, or in the form of patches, of variable size and shape. However this may be, it is of a grayish, whitish, or pale yellowish color, of a tough consistence, and more or less firmly adherent. It seldom consists of more than one thin layer. When the inflammation is violent, the lymph frequently extends upwards over the tonsils and palate, downwards into the œsophagus, and forwards into the larynx. Under such circumstances, too, it is occasionally of a dirty drab or cineritious appearance, from the admixture of sero-sanguinolent secretion. The deposit is usually preceded, for a day or two, by slight fever, and often extends with great rapidity. The subjacent mucous membrane, which furnishes it, is deeply injected, thickened, and of a scarlet color: in the more severe forms of the malady, it is softened, ecchymosed, rugose, and ulcerated, the lymph lying, perhaps, in immediate contact with the denuded muscular fibres of the part. The mucous follicles are uncommonly large and well developed; the tonsils are softened, tumid, red, and infiltrated with various fluids; and the submaxillary glands and the lymphatic ganglions of the neck often sympathize in the morbid action.

The *treatment* of this affection, especially in its endemic forms, is very uncertain, and the consequence is that many of those who are attacked with it die. The most reliable remedies, particularly at the commencement of the disorder, are gentle emetics and purgatives, followed by diaphoretics, and minute doses of calomel. As local applications, the most efficacious articles are acid nitrate of mercury, hydrochloric acid, and nitrate of silver, all in weak solution, employed twice or thrice in the twenty-four hours. Chlorate of potassa has been a fashionable remedy in the disease, but its effects have seldom been encouraging. Tonics, as quinine and milk punch, are generally required to sustain the strength. Change of air often proves highly beneficial.

4. *Granular Pharyngitis.*—In long-continued inflammation of the pharynx, the lining membrane of the throat is very prone to assume a granular condition similar to that which occurs on the eyelids in granular conjunctivitis. The dis-

ease, which may take place at any period of life, may be specific or non-specific, and is nearly always associated with inflammation of the uvula, palate, and tonsils. The granulations are frequently very numerous and prominent, and the mucous membrane upon which they repose is thick, spongy, villous, and of a deep red color. The general health is often materially impaired, and in many cases the patient is harassed with cough and dyspepsia. The diagnosis of this disease is always easily determined by a careful inspection of the parts.

In the *treatment* of granular pharyngitis special attention should be paid to the nature of the exciting cause and the state of the general health. The most important internal remedies are, blue mass, in alterative doses, mild purgatives, and quinine, either alone, or in union with iron. As a local means, the wet napkin is deserving of particular consideration; it should be worn chiefly at night, and its use should be conjoined with the application, once every third day, at first, of a weak solution of acid nitrate of mercury, and afterwards of solid nitrate of silver. In the intervals, the patient may occasionally gargle the throat with some mildly astringent lotion. When the disease is of a syphilitic character, recourse should be had to iodide of potassium and bichloride of mercury.

5. *Wounds.*—Wounds of the pharynx and œsophagus, already incidentally treated of elsewhere, are always serious accidents, on account of the importance of the functions of these tubes, and their complicated relations with other structures, which are liable to be injured at the same time. They may be transverse, oblique, or longitudinal, as it respects their direction, and incised, lacerated, contused, or gunshot, as it respects the nature of the vulnerating body. Their existence, which is commonly sufficiently evident, is always, in cases of doubt, easily determined by the escape of ingesta in eating and drinking. Whenever they are accessible, or can be rendered so by a proper enlargement of the external opening, their edges should be approximated by the interrupted suture, carried through the entire thickness of the tube, and placed at intervals not exceeding the fourth of an inch. The ends are tied into a double knot, and cut off close to the surface of the wound, to afford the loops an opportunity of falling into the passage, and thus descending into the stomach. That this is the most certain and rational method of managing these injuries is sufficiently evident from analogy and observation, and it is only surprising that it has hitherto been so seldom adopted.

When the stitching is completed, and the outer wound is closed, the chin should be brought forward upon the sternum by means of bandages carried round the head and underneath the axillæ. The after-treatment should be conducted with the greatest care and attention; inflammation must be kept down by appropriate measures, and the patient must be nourished with the stomach tube.

Occasionally a wound of the pharynx is followed by emphysema of the neck, the air passing from the fauces into the areolar tissue in such a manner as to impart a swollen and hideous appearance to this region. The distension from this cause may be so great as to produce serious impediment to respiration and deglutition, although in general the effect is very evanescent, and seldom requires any special treatment. Another effect, sometimes noticed in wounds of the pharynx, is aphonia. Larrey relates a case in which this accident followed a wound made with a bayonet, the point of which remained, for six weeks, deep in the left side of the pharynx, behind the arch of the palate. On its extraction, which was accomplished with great difficulty, the voice, which had been entirely lost, was instantly restored.

A remarkable case of recovery, after complete division of the pharynx, has been related by Dr. Porter, of New London. The wound, inflicted in an attempt at suicide, was nearly completely closed at the end of two months, but during the progress of the cure the hyoid bone together with a portion of the epiglottis sloughed away, and the man remained aphonious.

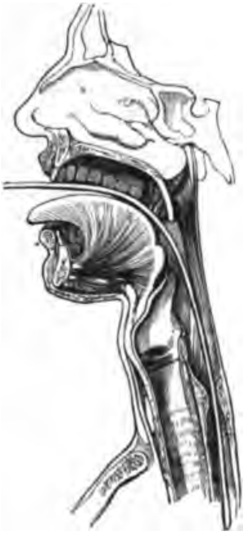
6. *Stricture.*—Of stricture of the œsophagus—for the affection rarely occurs in the pharynx—there are two varieties, the spasmodic, and the organic.

The *spasmodic stricture* of the œsophagus is altogether a very singular disease.

It is most common in nervous, excitable girls, soon after the age of puberty, though I have repeatedly witnessed it in very young children of both sexes. Old maids and married women about the decline of the menses are also particularly prone to it. It is produced by a great variety of causes, of which disorder of the uterine functions, derangement of the digestive organs, spinal irritation, and obstruction in and around the tube, as that occasioned by the presence of a foreign body, disease of the larynx, or the pressure of an aneurism, abscess or enlarged lymphatic ganglion, are the most common. It is often intimately associated with hysteria, recognizing the same origin, and forming merely, as it were, one of the complications of that Protean affection. Instances occur in which it is produced by the irritation of hemorrhoidal tumors, the removal of which promptly cures the disease. The characteristic symptoms are, severe pain in the œsophagus, or in the œsophagus and pharynx, a sense of constriction in the chest, as if a cord were drawn firmly round it, great difficulty or utter impossibility of swallowing, embarrassment of breathing, and intense mental anxiety, with a feeling of impending suffocation. The attacks often appear suddenly and unexpectedly, and occasionally vanish in the same mysterious manner; their intensity and duration are subject to much diversity, being now mild and short, now severe and protracted. Cases occur in which the disease manifests a periodical tendency, coming and going very much like a paroxysm of intermittent fever.

The *treatment* of this disease must be regulated according to the nature of the exciting cause, which should, therefore, always be carefully inquired into. Nothing, of course, can be done in the way of permanent relief when it depends upon the pressure of an aneurism of the aorta, or of the innominate or carotid artery, a bulky goitre, or a mass of enlarged lymphatic ganglions, whether cervical or intra-thoracic. When the difficulty is caused by an abscess, or the impaction of a foreign body, the remedy is sufficiently obvious, and so also when it is produced by organic disease of the larynx, or by the presence of a polyp in the fauces, pharynx, or œsophagus. In exploring the tube with a view of ascertaining the source of the obstruction, the greatest caution should be used in the passage of bougies and other instruments, lest we lacerate the gullet, or, in case of an overlying aneurism, perforate its sac, and thus occasion instant death.

Fig. 378.



Stricture of the gullet, at its most ordinary site, with a bougie passed through it by the mouth.

The general health is, in all cases, amended by suitable means; the bowels are constantly maintained in a soluble condition; the secretions are corrected and restored; spinal irritation is removed by leeches, cupping and vesication; and proper attention is paid to the diet, exercise and other hygienic measures. In the purely nervous form of the affection, the patient will be immensely benefited by systematic purgation, by chalybeate tonics, either alone or in union with quinine, by the shower-bath, and by gentle exercise in the open air. During the attack, relief is attempted by anodynes, assafœtida, valerian, and compound spirit of ether, sinapisms to the spine, the warm bath, and the passage of the probang, which often acts like a charm, almost instantaneously removing the pain and suffering, obviously upon the same principle as the bougie does in spasmodic stricture of the urethra. In obstinate cases the parts at the seat of the obstruction are carefully mopped with a weak solution of nitrate of silver, repeated every fourth day.

Organic stricture of the œsophagus is rare. It may occur in any portion of the tube, but its most common site is just below the cricoid cartilage, or near the junction of the œsophagus and pharynx, as seen in fig. 378. It is seldom that more than one stricture of this kind is observed in the same person. The immediate cause of the disease is inflammation, whether produced spontaneously, by external injury, by hot water, or by the contact of acrid substances, as alkalies and acids. Most of the cases that I have met with occurred in subjects under thirty years of age; but it is liable to arise at all periods of life, and is equally common in both sexes. I am not aware that occupation engenders any predisposition to the disease.

If a dissection be made of a person dead of organic stricture of the œsophagus, it will be seen that the principal seat of the malady is in the lining membrane and the submucous cellular tissue, which are unnaturally hard, firm, resisting, and of a grayish, whitish, or slightly bluish appearance. It is only in the more aggravated cases that there is any serious involvement of the muscular fibres. The contraction may be limited to one side of the tube, or it may include its entire circumference, which, in fact, is most common; in depth it varies from a few lines to several inches. The degree of obstruction ranges from the slightest diminution of the caliber of the tube to almost complete occlusion, as in organic stricture in other mucous canals. The œsophagus, immediately above the seat of the coarctation, is usually dilated into a kind of subsidiary pouch, which, in severe cases of long standing, is sometimes capable of containing from six to ten ounces of fluid or ingesta. The mucous membrane is generally somewhat attenuated, occasionally opaque and thickened, and, now and then, even ulcerated. The portion of the canal below the stricture is commonly normal.

The *symptoms* of the disease are not, at first, characteristic, as they are merely denotive of impeded deglutition, with a sense of uneasiness in the neck, chest, or precordial region. As it progresses, the patient finds it more and more difficult to swallow both solids and fluids, especially the former, which are often arrested in considerable quantity just above the stricture, from which they either gradually descend into the stomach, or they are at length ejected by vomiting, or, more properly speaking, by regurgitation. Not unfrequently the deglutition is suddenly interrupted by spasm of the part, which compels the patient to desist from further efforts, until the action has subsided. At times, again, he suddenly experiences a sense of suffocation, attended with a feeling of constriction in the chest, palpitation of the heart, and great mental anguish. When the malady is fully established, there is always serious disorder of the digestive apparatus, as flatulence, acid eructations, and constipation; the flesh and strength decline; the countenance has a wan, sallow, pinched appearance; the extremities are habitually cold; the surface is easily impressed by atmospheric vicissitudes; and the poor sufferer, a prey to the worst forebodings, at length dies completely exhausted.

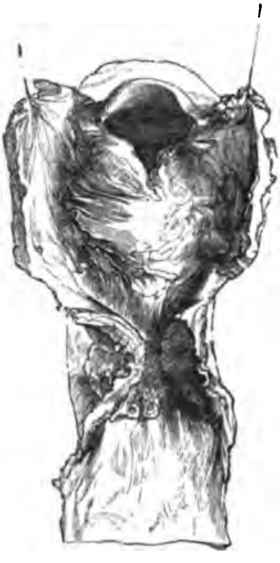
The *diagnosis* of organic stricture can only be determined by a thorough exploration with a bougie, of which one of gum-elastic is the best. In the absence of such an instrument, however, a piece of whalebone, surmounted with a short cylinder of ivory, may be used as a convenient substitute. The head being thrown backwards against the breast of the surgeon, so as to bring the mouth on a line with the fauces, the bougie, well oiled, is carried down to the obstruction, the precise seat of which is thus at once ascertained. To determine its consistence, it is only necessary to note the degree of resistance offered to the passage of the instrument; if this is slight, it may be inferred that the stricture is slight also, and conversely. To obtain a definite idea of its extent, both longitudinal and peripheral, the bougie is carried not only into the stricture, but, if possible, through it.

The *prognosis* is commonly very grave, the disease being always very obstinate and intractable, setting at defiance the best directed efforts of the surgeon for its relief. In particular is this the case when it has been caused by loss of substance, as a wound, ulceration, or gangrene, or when it has been induced by high inflammation from the contact of an acrid substance, as an alkali or acid. The affection is also, in general, more difficult to cure in the old than in the young, and in such as have been injured by previous disease, intemperance, and other kinds of indulgence, than in those of a healthy, robust constitution.

The *treatment* of this affection is easily understood; for, as it essentially consists in a deposit of plastic matter in the mucous and submucous tissues of the œsophagus, the leading indication is to get rid of this substance, so as to afford the parts an opportunity of regaining their normal caliber, consistence, and resiliency. As a preliminary step, an effort should be made to improve the general health, which is usually considerably disordered, by attention to the diet, bowels, and secretions. When this object has been attained, a gentle course of mercury should be commenced, either in the form of the iodide, mild chloride, or bichloride, the choice of the article being regulated by the peculiar features of the case. Very slight ptyalism is encouraged, and persistently maintained for several weeks. Concurrently with this treatment the bougie is used, at first once every fourth day, and then every other day, the instrument being retained a few minutes at each introduction, and its size gradually increased as the stricture yields under the dilating process. Much caution is necessary in both these particulars, lest further effusion instead of absorption take place. Cauterization with nitrate of silver may be necessary when the parts are unusually irritable, but, in general, it should be avoided; it is best performed by means of an instrument constructed on the same principle as that used for the urethra, and moved about in such a manner as to bring the substance as gently as possible in contact with every portion of the affected surface. In very obstinate cases, depending upon the presence of an inordinate quantity of fibroid or fibro-cartilaginous tissue, scarification might be employed, but such an operation should never be undertaken without great care and deliberation. Restoration of caliber being effected, the labor of the patient and surgeon is not ended; on the contrary, vigilant supervision of the general health is steadily maintained, and the insertion of the bougie is repeated at gradually increasing intervals until all danger of relapse is safely passed.

7. *Carcinoma.*—Malignant disease of these tubes usually presents itself in the form of scirrhus, as in fig. 379, commencing as an infiltration in the submucous cellular tissue, and gradually extending to the other structures, especially the mucous. Encephaloid is exceedingly rare, and I am not aware that any example of colloid has ever been met with. The most common site of the heterologous deposit is the œsophagus just behind the larynx, but it may occur in any portion of the canal, and occasionally, though very rarely, it has been known to occupy the pharynx. Old persons are most prone to this disease, and females suffer more frequently than males. The symptoms are those of dysphagia, attended with pain, and a sense of constriction in the chest. The swallowing becomes more and more difficult, and at length even liquids can hardly be forced across the obstruction. The pain is usually of a sharp, pricking, lancinating character, and darts about in different directions, up towards the head and fauces, down towards the stomach, and back towards the spine. The flesh gradually wastes, the countenance exhibits a sallow, cadaverous aspect, obstinate hiccup supervenes, and the patient, worn out by protracted suffering, finally perishes from inanition. Death usually occurs at a period varying from ten to eighteen months. In some instances, especially when ulceration is present, life may be destroyed by hemorrhage; while occasionally, again, though this also is very rare, the fatal event is produced by the escape of ingesta into the windpipe, the mediastinum, or the pleuritic cavity. The causes of carcinoma of the pharynx and œsophagus are similar to those of malignant growths in other parts of the body. The diagnosis may, in general, be easily determined by the history of the case and by a thorough exploration

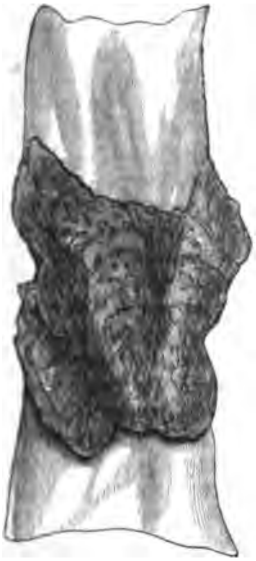
Fig. 379.



Carcinoma of the œsophagus.

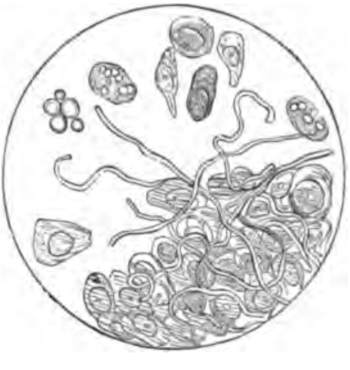
of the affected parts with the bougie. In the use of this instrument a portion of the tumor is sometimes detached and brought up, and, when this is the case, it may readily be subjected to microscopical inspection. The ulcerated form of scirrhus of the œsophagus is well represented in fig. 380, from a specimen in my collection. The microscopical structure is beautifully shown in fig. 381, from a drawing by Dr. Packard. The tumor was situated near the cardiac extremity of the tube; and the man, who was between thirty-five and forty years of age, finally perished from inanition.

Fig. 380.



Ulcerated scirrhus of the œsophagus.

Fig. 381.



Microscopical characters of cancer of the œsophagus.

The *treatment* is, of course, merely palliative. The strength is sustained by nourishing broths, taken by the mouth or rectum, and pain is allayed by anodynes. Great temporary relief, as I have found from repeated trials, may frequently be obtained by the occasional introduction of a bougie or probang, so as to dilate the passage gently at the seat of the obstruction.

8. *Polyps.*—The pharynx and œsophagus, especially the former, are occasionally, though very rarely, the seat of polyps, similar to those in some of the other mucous outlets. The most common variety is the pedunculated, the tumor being attached, as the name implies, by a narrow footstalk, sometimes of extraordinary length, while its body, which is usually pyriform, lies loose in the interior of the tube. When situated high up, it is sometimes projected into the fauces and even into the mouth when the patient coughs or retches, and by this circumstance alone the disease may ordinarily be readily distinguished from other growths. Dysphagia, from mechanical obstruction, of course exists when the tumor is large, either alone, or, as is more commonly the case, in union with pain, dyspnœa, and suffocative sensations; but the general health remains good much longer than in scirrhus, the progress of the malady is comparatively tardy, and there is always an absence of cancerous cachexia. When the morbid mass becomes fixed, the diagnosis will be more difficult, and its decision will then hinge mainly upon a correct appreciation of the history of the case.

The structure of these tumors is still involved in obscurity. In the most common form of the affection, however, it is of a cellulo-fibrous nature, soft, inelastic, and of a reddish color, not unlike that of a cherry. Small straggling vessels generally ramify over its surface, and are apt to give way under rude manipulation, furnishing thus occasionally quite a smart hemorrhage. The proper substance of the tumor itself, however, is not very vascular, and it therefore rarely bleeds much during removal.

If the polyp is within reach, it may generally be readily seized with the forceps, and twisted off at its point of attachment to the mucous membrane. When it is situated a considerable distance down the tube, removal may be attempted in the same manner, but in this event it will be necessary to employ a longer instrument, and one that is curved somewhat on the flat; or, instead of this, the growth may be noosed with a silver wire, passed by means of a double canula, and broken off by gentle rotation of the tube, aided by cautious efforts at extraction. Unless their base is very broad, or their seizure very imperfect, few tumors of this kind would be likely to resist such a procedure. Failure, however, is possible, and then, provided the polyp is situated in an accessible part of the canal, œsophagotomy may be necessary. Excision of the tumor is inadmissible, on account of the subsequent hemorrhage, which it might be very difficult to control.

9. *Paralysis.*—Paralysis of these tubes is sometimes met with, chiefly in old persons affected with palsy of other parts of the body. The characteristic symptom is simply dysphagia, without mechanical obstruction, and, consequently, without any impediment to the passage of the bougie. The disease is usually of unfavorable import, especially when of gradual accession, and the result of organic lesion of the brain, or of the brain and spinal cord. When the attack is sudden, as when the paralysis is induced by apoplexy, or external violence, the danger is not so great, and ultimate recovery may, in many cases, reasonably be expected.

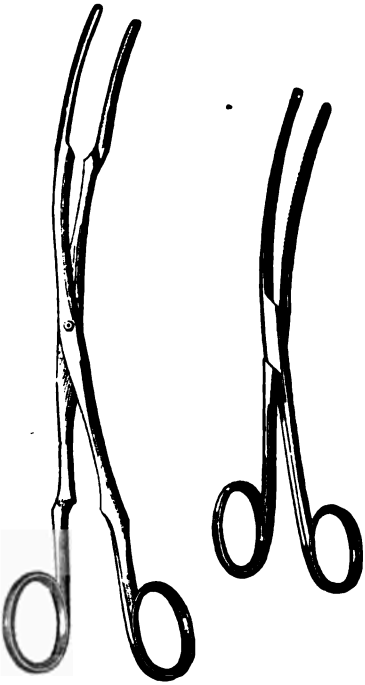
The *treatment* is regulated by the nature of the exciting cause, and does not, therefore, admit of specific detail. In the more chronic forms, our chief reliance is upon systematic purgation, gentle but persistent ptyalism, iodide of potassium, strychnia, and counter-irritation of the dorso-cervical portion of the spine, by blister, issue, or moxa. When the strength is much reduced, electricity, the shower-bath, either cold or tepid, the use of the flesh brush, tonics, and other invigorating measures will be required. Until the œsophagus has regained its muscular powers, the requisite amount of food and drink must be introduced into the stomach by means of an elastic tube.

10. *Foreign Bodies.*—Foreign bodies are liable to lodge upon the root of the tongue, between the arches of the palate, in the mucous follicles of the tonsils, around the mouth of the larynx, in the pharynx, and in the œsophagus. They generally consist of fish and chicken bones, fragments of the kernels of fruit, bits of meat, cartilage, or tendon, pieces of coin, pins, needles, mounted artificial teeth, and other analogous substances. In cleaning the teeth, the bristles of the brush often fall out, and become entangled in the throat. In fact, substances of every form and character are liable to be arrested in these passages, and it is only surprising, when we consider the complex structure of the fauces, that accidents of this kind are not more common. Whatever their nature may be their presence always awakens great uneasiness, if not actual pain, with a sense of soreness, and a frequent desire to swallow and clear the throat. Occasionally, there is a marked increase of the salivary secretion, an abundant flow of ropy mucus, and an alteration of the voice, which is hoarse and guttural. If the foreign body remains for any length of time, inflammation will be almost certain to take place, and may run so high as to induce intense distress, if not loss of life.

When the extraneous body is of large size, and impacted in the lower part of the pharynx, or in the upper extremity of the œsophagus, a prominent symptom will be difficulty of breathing from spasm of the glottis. When the pressure is very great, or long-continued, suffocation may take place in the same manner as when a foreign substance is lodged in the windpipe. Desault mentions a case in which a woman lost her life in three minutes from strangulation, occasioned by the impaction of a piece of bone in the middle of the pharynx. Many similar examples have been recorded.

Clearance is attempted as early as possible after the accident, with the finger, forceps, or emetics, according to the exigencies of the case. If the intruder is within sight, it may often be reached with the finger; or this failing, it may be extracted with a pair of polyp-forceps, the tongue being previously depressed with an appropriate instrument. When this organ is unsteady, or absolutely rebellious, quietude is first insured by the inhalation of a moderate quantity of chloroform. Not a little trouble is sometimes experienced in finding the extraneous substance, especially when it is very diminutive, or when it is lodged in one of the mucous follicles of the tonsils, between these bodies and the arches of the palate, or in the pouches at the root of the tongue. When this is the case, a thorough exploration is made with the finger, aided with a grooved director, a long probe, or a large spoon, with a long, slender handle, with which the parts are pushed gently asunder, and exposed to light. Should the attempts at extraction fail, relief is sought by emetics, of which the most prompt and efficacious are alum, zinc, copper, and mustard, their action being promoted by large draughts of water, during the regurgitation of which the intruder is often safely ejected. It is a common circumstance, and one of great practical moment, that, although the foreign body may have been expelled, the irritation awakened by its presence often remains for a considerable time, thus inducing the impression in the mind of the patient that he is still unrelieved. I have repeatedly known this feeling to continue for a number of days, and occasionally, especially in hysterical females, for several weeks.

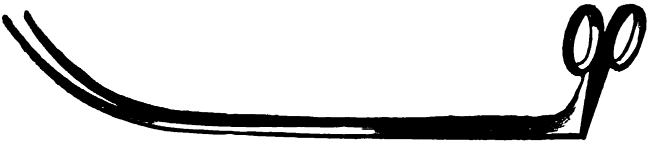
Fig. 382. Fig. 383.



Bond's œsophagus forceps.

When the foreign body is lodged in the œsophagus, or in the inferior part of the pharynx, extrusion is often readily effected with a pair of long, slender gullet forceps, such, for example, as those represented in figs. 382 and 383, invented by Dr. Bond, of this city. These forceps, besides being very light and curved, are beveled off at the edges, an arrangement which effectually prevents them from seizing and pinching the mucous membrane, an occurrence so liable to happen in the use of the ordinary instrument. Moreover, it admirably fits them for withdrawing needles, pins, and other sharp-pointed bodies, which, while they are firmly held by the blades, fall into the groove at their sides, and thus slide along the passage without seriously injuring its walls.

Fig. 384.



Burge's œsophagus forceps.

An excellent instrument, in some respects superior to that of Dr. Bond, was recently devised by Dr. Burge, of Brooklyn, and is delineated in fig. 384. It is so constructed that a gentle movement of the thumb and index finger causes the blades to open and shut, while the rest of the instrument remains apparently motionless. This is effected by the rolling character of the hinge which connects the blades, and which extends throughout the whole length of the straight portion of the forceps, a distance of about six inches. The blades, which are at a right angle with the handles, are rounded and smooth externally, but flat and slightly roughened internally, and form, when closed, a simple style of the most convenient size and shape.

In performing the operation, the patient sits upon a low stool, with his head thrown backwards against the breast of the surgeon. The instrument, well oiled and warmed, is then passed down into the tube, and used as a searcher; as soon as it is brought in contact with the extraneous substance, its blades are expanded over it, and extraction is effected in as gentle a manner as possible. Generally no after-treatment is required.

Occasionally a blunt hook is used for effecting extraction. It is carried down in the same manner as the gullet forceps, if possible, beneath the foreign body, which is then seized and drawn up. Pieces of coin, pins, and bits of bone are sometimes readily removed in this way. A very singular case, in which an operation of this kind proved fatal, occurred many years ago at Cincinnati. A female having, as she supposed, swallowed a pin, a practitioner endeavored to extract it by means of a common dress-hook, secured to the end of a piece of whalebone. In his attempt to withdraw it, the hook became fastened in the œsophagus, the walls of which were severely lacerated. Violent inflammation ensued, followed in a few days by the death of the patient. The late Professor Cobb, who used to have the preparation in his private cabinet, made the dissection, and discovered, just below the larynx, a rent, upwards of an inch and a quarter in length. No pin was found, and the probability was that none had ever been swallowed!

Fig. 385.

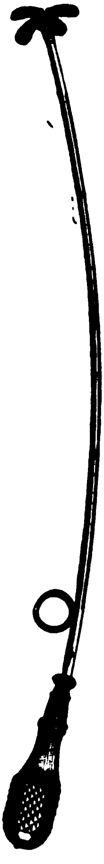
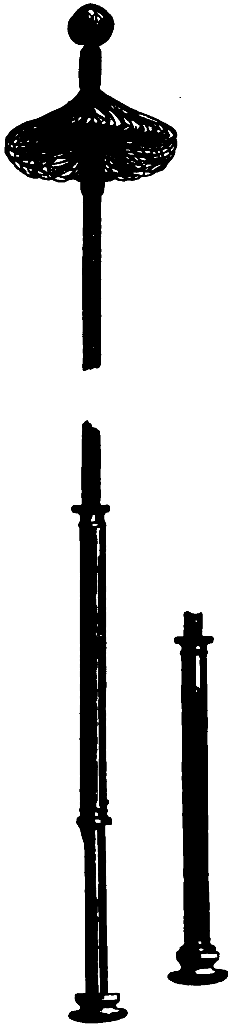


Fig. 386.



Instruments for extracting foreign bodies from the œsophagus.

An excellent instrument for extracting foreign bodies from the œsophagus is represented in fig. 385. It was constructed at my suggestion, by Mr. Kolbe, and consists of a steel rod, about fifteen inches long, inclosing a stilet, surmounted by four wing-like processes, which may be shut or expanded at pleasure, simply by turning the handle. Another convenient contrivance, tipped with bristles, and acting upon similar principles, is exhibited in fig. 386. Pins, needles, and other slender substances, may sometimes be entangled in the loops formed by tying a number of horsehairs to the extremity of a piece of whalebone.

When the substance is of a digestible nature, as a piece of bread, potato, or beef, and cannot be readily extracted, it should be pushed down into the stomach by means of a probang, an instrument consisting of a stout whalebone rod, surmounted by a piece of sponge. The operation, which should be performed with great gentleness, the patient sitting on a chair, with the head inclined backwards, is not always so easy as might be imagined. Many years ago I attended a man, in the inferior part of whose œsophagus a large piece of veal had lodged, where it produced excessive irritation and so much spasmodic action as to render it extremely difficult to force it into the stomach. For several hours his embarrassment of breathing and thoracic distress were most intense.

A fish-hook along with a piece of its line is occasionally swallowed. An instance of this description, the first of the kind, I believe, on record, occurred in 1814, in the practice of Dr. Bright, of Kentucky. Having ascertained that the foreign body was quite small, he supposed that if a ball, pierced at the centre, were passed over the line, and allowed to fall forcibly against the hook, it would be likely to detach it from the coats of the œsophagus, in which there was reason to believe it had been arrested. The experiment was accordingly tried, and the success was complete. The hook having lost its hold, applied itself against the lower surface of the ball, which thus, in the withdrawal of the line, prevented its barb from injuring the passage.

When a foreign substance, especially if it is rough, sharp, or angular, is retained for any length of time in the gullet, it may occasion serious inflammation, followed by abscess, gangrene, ulceration, or even loss of life. Dorsey has related an instance in which a youth of seventeen suddenly perished from a copious hemorrhage, induced by the long-continued lodgment in the œsophagus of an English farthing. Needles, pins, and bits of bone, after having sojourned for a while in the œsophagus or pharynx, often descend into the stomach, and are ultimately voided by the bowels; or, instead of this, they perforate the coats of these tubes, and travel over different parts of the body, being, perhaps, at length eliminated through the skin; or, finally, they enter the thoracic cavity, and produce destructive inflammation of its contents. Mr. Kirby, of Dublin, has related the case of a woman who bled to death from injury sustained by the right subclavian artery, from a piece of bone which had perforated the œsophagus, behind which the vessel lay in its anomalous course from the arch of the aorta towards the right side of the trunk.

When a foreign body has been for a long time impacted in the œsophagus, it occasionally becomes so completely buried in the walls of this tube as to elude the contact of the probe, bougie, or probang employed for its detection, the instrument rapidly passing on into the stomach as if there were no obstacle. A knowledge of this fact should put the surgeon upon his guard in respect to his diagnosis. A number of instances have been recorded in which, although all the rational symptoms existed, substances of large size, concealed in this way, were not discovered until after death.

11. *Œsophagotomy.*—I have never performed œsophagotomy, and such an operation will, I presume, rarely, if ever, be required, if a proper direction be given to our attempts at extrusion. It is only when the foreign body is immovably fixed in its position that the question should be at all entertained. Should the operation be decided on, it may be executed in the following manner:—The neck being stretched, the head retracted, and the foreign substance made to project as far as possible on the left side of the windpipe, an incision, several inches in length, is made directly over the swelling through the skin and platysma myoid muscle. The tube being thus exposed, and any vessels and nerves that may be in the way held aside, its wall is divided to the requisite extent, and the substance, whatever it may be, is extracted with the finger or forceps, as may be found most convenient. As soon as clearance has been effected, and the bleeding arrested, the edges of the œsophageal wound are neatly approximated by several points of the interrupted suture, made with very fine, but strong silk, the ends being cut off close to the knots, to afford the ligatures an opportunity of dropping ultimately into the interior of the passage. The cutaneous wound is dressed in the usual manner and the case is afterwards managed upon general principles, the patient being supported during the first week with broths, con-

veyed, if necessary, by means of a tube, into the stomach, or, what will be better, introduced into the rectum.

Mr. Cock has given a record of seven cases, including one by himself, in which this tube was opened for the removal of a foreign body. Of these, five were successful and two fatal, one of the patients dying at the end of fifty-six hours from pneumonia, which existed at the time of the operation, and the other in two days from stomatitis and gangrene of the pharynx.

12. *Passage of Tubes along the Œsophagus.*—The practitioner is sometimes obliged to insert tubes into the stomach for washing out its contents, as in poisoning, or for injecting food into the organ with a view of sustaining life, as in disease of the pharynx and œsophagus. In the former case, the addition of a pump is necessary; in the latter, a gum-elastic bottle. The tubes for either of these purposes should be at least eighteen inches in length, and from four to six lines in diameter. The patient being seated upon a chair, with his head reclining against the breast of an assistant, the instrument, carefully oiled, is cautiously conducted down into the pharynx, and thence along the œsophagus into the stomach. If poison is present, tepid water is now injected, and immediately after withdrawn with the pump, though not the whole of it, lest the mucous membrane of the stomach be sucked into the holes of the tube, and so torn into shreds. The operation is repeated until thorough clearance is effected, or until the fluid returns colorless, the quantity thrown in at each time varying from a pint to a quart, according to the age of the patient and the circumstances of the case. When the tube is inserted for the purpose of injecting nutriment, the liquid should be introduced very slowly, so as not to occasion sudden and painful distension.

It seems to me that none but the veriest bungler could pass such an instrument into the windpipe instead of into the œsophagus, and yet, judging from the cautious manner in which writers lay down their instructions for its introduction, we are forced to conclude that such an occurrence is not only possible, but occasionally quite probable. The accident would, it may be presumed, be most likely to happen when the patient is in a state of deep coma or partial asphyxia, thus preventing him from perceiving the contact of the instrument. It has been proposed, in such an event, to hold a lighted taper before the tube, on the assumption that, if it be extinguished, it is to be regarded as an evidence that the instrument is in the windpipe, and conversely. But such a procedure is altogether unsatisfactory, and the only safe plan, at last, for the surgeon, is to rely upon his knowledge of anatomy, and his manual dexterity. The very facility with which the tube glides along may be taken as an evidence that it is descending the œsophagus.

CHAPTER XIV.

HERNIA.

SECT. I.—GENERAL OBSERVATIONS.

By the term hernia, as used at the present day, is understood a protrusion of any of the abdominal viscera through a natural or accidental aperture in the abdominal walls, accompanied by a process of the peritoneum, and invested by the common integuments. The parts most liable to this occurrence are the intestines, especially the small, and the omentum. Of the small bowels, the portions most generally concerned in the descent are the ileum and the inferior third of the jejunum. The duodenum is too fixed in its situation to admit of such an accident. The arch and sigmoid flexure of the colon occasionally pass out of the abdomen, and the same fate is sometimes, though rarely, experienced by the cæcum and vermiform appendix. Now and then an instance occurs in which a portion of the stomach, liver, spleen, or urinary bladder forms a constituent of the hernia. Cases are also witnessed in which the ovaries, the Fallopian tubes, and even the uterus are protruded. The rectum has occasionally been found included in an ischiatic hernia.

Various *terms* are employed to designate such a tumor, derived either from the nature of its contents, the particular condition of the included structures, or the region of the body in which it occurs. Thus, when the protrusion consists of intestine alone, it is called an enterocele; epiplocele, when it is composed merely of omentum; and entero-epiplocele, when it consists both of intestine and omentum. A hernia is said to be reducible when its contents can readily be returned into the peritoneal cavity; irreducible, when they remain permanently fixed in their abnormal situation; and strangulated, when they are confined by a stricture, or compressed by the edges of the aperture at which they emerged. The term incarcerated is used to denote the temporary sojourn of the parts in their extra-mural situation, without any obstruction to the passage of the feces, and the existence of inflammatory symptoms. The words inguinal, scrotal, femoral, umbilical, ischiatic, obturator, and labial, have reference to the particular regions in which the descent takes place. A rupture sometimes occurs at birth, and it is then said to be congenital. Finally, a hernia may be recent or old, complete or incomplete, single or double.

The *frequency* of hernia cannot be correctly estimated, nor is this a matter of any particular practical moment. It doubtless differs in different countries, in different occupations, and in different classes of society; the poor being much more obnoxious to it than the rich. The affection occurs at all periods of life, from the cradle to the grave.

An idea of the influence of *age* upon the production of hernia may be formed from the following table, founded upon 77,997 cases reported by the London Truss Society:—

YEARS.	CASES.
From 1 to 10	7,229
" 10 " 20	4,551
" 20 " 30	8,715
" 30 " 40	13,614
" 40 " 50	15,627
From 50 to 60	14,169
" 60 " 70	9,761
" 70 " 80	3,866
" 80 " 90	442
" 90 " 100	23

Both *sexes* are subject to hernia, but men in a much greater degree than women, in the proportion probably of about four and a half to one. Thus, out of 83,584 patients relieved by the London Truss Society, 67,798 were males, and 15,786 were females.

Men suffer most frequently from inguinal hernia; women, from femoral and umbilical; the differences depending either upon anatomical causes, or physical conformation.

Causes.—The causes of hernia are usually divided into predisposing and exciting. Among the former the principal are, inordinate size of the normal outlets of the abdomen, and the existence of preternatural apertures, from defective development of the walls of this cavity. Under the same head may be included unusual laxity of the muscles and tendons of the abdomen. Distension of the abdomen by pregnancy, ascites, obesity, and different kinds of tumors also favor the formation of hernia. The same is true of tight lacing, mechanical obstruction to the evacuation of urine, chronic disease of the lower bowel, and general debility, whether natural or acquired.

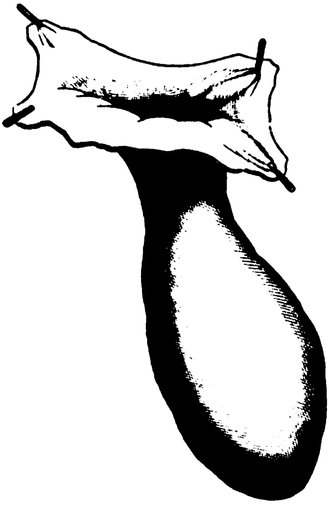
The most common exciting cause of the disease is inordinate contraction of the diaphragm, pushing the abdominal viscera forcibly against their walls, at a time when these walls themselves are in a state of excessive tension. The contained and containing structures being thus made to act and react upon each other, the floating parts of the former are often readily thrust across the resisting parts of the latter. Hence hernia is most generally produced in straining at [illegible] lifting heavy weights, playing on wind instruments, [illegible] and coughing. Occasionally the occurrence is the [illegible] violence, as a blow or wound, separating or severing [illegible] structures of the walls of the abdomen.

[illegible] are a frequent cause of hernia. The culpable manner [illegible] are generally treated can hardly fail to be followed by [illegible] The puncture made in paracentesis has occasionally [illegible] Many years ago a remarkable case of this kind occurred [illegible] who was tapped by an eminent practitioner, under the sup[illegible] ascites. It turned out, however, that she was merely in an [illegible] pregnancy. The operation brought on premature delivery, [illegible] after by ventral hernia, which, increasing in volume, became at [illegible] troublesome, the more so, as it was subject to occasional attacks of [illegible] in one of which she lost her life.

[illegible]—Every hernia has a distinct sac, besides a certain number of other [illegible] a mouth, a neck, and a body. Each of these parts is of sufficient importance to require separate consideration.

The sac forms the immediate investment of the protruded parts, and is of a serous nature, being, in fact, merely a prolongation of the parietal portion of the peritoneum, pushed down during their descent. It varies much in its structure, as well as in its size and shape. In the earlier stages of hernia, it generally retains both its normal transparency and tenuity; but in cases of long standing, and particularly in those of large bulk, it is almost always considerably thickened, opaque, dense, and even fibrous; its free surface is rough, corrugated, discolored, and often incrusted with lymph; and the subjacent cellular substance, which is frequently separable into several layers, is commonly indurated, and occasionally loaded with fatty matter. Serum sometimes accumulates in considerable quantity in the sac, constituting a species of genuine dropsy. It need hardly be added that these changes are all the direct product of the inflammatory action which the sac experiences during the progress of the disease. The sac also admits of great extension, as is shown in certain forms of scrotal hernia, in which the tumor descends nearly as low as the knee. Sometimes the sac, instead of being thickened, is remarkably attenuated, or very thin at one point and thickened at another; occasionally, again, cases are witnessed in which it has given way, either by absorption or laceration. It is also to be remembered that there are certain varieties of hernia in which the protruded parts receive only a partial investment of this kind. This is uniformly the case in hernia of the cæcum and bladder, which are but imperfectly covered by peritoneum, in the natural state. A rupture following upon a wound is always destitute of a proper sac.

Fig. 387.



Hernial sac, with its mouth, neck, body, and fundus.

The *size* of the sac varies from a pigeon's egg to that of an adult's head. In general, it may be assumed that the younger a rupture is the smaller will be the sac, and conversely. It has already been stated that, in scrotal hernia, the tumor occasionally reaches nearly as low down as the knee. Its shape, which is liable to endless diversity, may be globular, pyriform, conical, cylindrical, or hemispherical; occasionally it has a constricted, hourglass arrangement, or it consists of alternate dilatations and contractions. A double sac is sometimes met with. The annexed drawing, fig. 387, from a preparation in my collection, affords a good illustration of the more common shape of the hernial sac.

The other investments of the tumor vary in number, as well as in character, in the several regions in which they are situated, and will be described along with the different varieties of hernia. Meanwhile, it may be remarked that every rupture has an integumentary envelop, consisting of skin and cellular tissue, either in their natural state, or variously altered by the pressure of the protruded parts. Muscular fibres seldom form a distinct tunic in any of the varieties of the affection.

The *mouth* of the hernia is that portion of the tumor which forms the communication between the sac above described and the general peritoneal cavity. In its shape it generally resembles an elongated fissure, but in some instances, especially in old and bulky ruptures, it is nearly circular. Its size varies from that of a small aperture to that of an opening capable of admitting a large fist. Two or more sacs have been known to communicate with the abdomen by a common mouth.

The *neck* of the hernia lies just below its mouth, being the narrow, constricted portion, embraced by the edges of the natural or accidental orifice at which the descent takes place. These boundaries are formed either by muscular, tendinous, or aponeurotic fibres, and, from the character which they play in the production of strangulation, deserve to be studied with the greatest care and attention.

The *base* of a hernia is its lower extremity, and the *body* that portion which lies between the base and the neck.

When the contents of a hernia are prevented from protruding, the neck of the sac has a remarkable disposition to close, so as to destroy, either partly or completely, its communication with the general peritoneal cavity. In time the whole sac may be obliterated, or, as more frequently happens, it remains, and becomes filled with water, forming a tumor similar to a hydrocele of the vaginal tunic of the testicle. By the side of this tumor another protrusion may afterwards occur, the viscera passing through the same orifice, and pushing down before them a fresh process of peritoneum.

These old sacs are sometimes a source of much embarrassment to the surgeon in operating for the relief of strangulated hernia, from the fact that they overlap the protruded viscera, and thus serve to mask the parts. The difficulty is greatly increased when, as occasionally happens, the contents of the tumor, in consequence of an extension of the inflammation, assume a bloody character.

The *volume* of a hernia, however constituted, is liable to much diversity, and hardly admits of any definite statement. Generally speaking, it may be assumed that the more recent a rupture is the smaller will be its bulk, and conversely; but this law has many exceptions, as is shown, for example, in cases of hernia consequent upon severe muscular exertion and external injury, as a laceration or division of the walls of the abdomen, in which such a protrusion often has a large bulk at the very moment of its occurrence. There are also regional differences in regard to the size of these tumors. Thus a femoral hernia is always, other things being equal, much smaller than an inguinal hernia, its size rarely exceeding that of a pigeon's egg, or an almond. The largest tumors of this kind are generally old scrotal and umbilical ruptures.

The *shape* of the tumor is usually intimately connected with that of the proper hernial sac, already described. The most common forms are the globular, ovoidal, cylindrical, and pyriform. In some instances the tumor has a flat, compressed appearance, or the figure of an hour-glass.

Much diversity obtains in regard to the *quantity* of the protruded structures; in general, however, it is in direct proportion to the size of the tumor. In enterocele the contents of the hernia may consist nearly of the whole of the floating portion of the bowel, of a small loop, or of a part merely of the circumference of the tube; too small, perhaps, to form the slightest appreciable swelling upon the external surface. Large quantities of the omentum also sometimes descend, but in most cases the protrusion is small.

1. REDUCIBLE HERNIA.

The symptoms of reducible hernia are greatly influenced by the nature of the protruded structures. An *enterocele* is soft and elastic; smooth, or nearly smooth, on the surface; free from pain and soreness; and of a globular, ovoidal, or conical figure. It imparts a distinct impulse to the finger when the patient coughs; has a gaseous feel; often emits a clear sound on percussion; and disappears during recumbency, but is reproduced immediately on the resumption of the erect posture. The reduction is generally effected suddenly and in mass, with a gurgling, rumbling, or explosive noise. When the bowel, however, contains much solid matter the tumor may be hard, unequal, nearly inelastic, and return lazily and almost noiselessly. The size of an enterocele is often considerably influenced by the condition of the alimentary canal; being smaller after fasting and the use of purgatives, and larger when the tube is distended with food, gas, or fecal matter.

In *epiplocele*, the tumor is of a more irregular figure, and of a flabby, doughy consistence, very different from that which characterizes an enterocele; it emits no sound on percussion; imparts no impulse on coughing; is free from tension; does not expand or diminish during the repletion or vacuity of the alimentary tube; and is always reduced with more difficulty than a protruded bowel. Omental, like intestinal hernia, may occur at any period of life, but is more frequent in elderly than in young subjects. A double omental hernia is sometimes met with I have seen examples of it both in the inguinal and femoral regions.

In an *entero-epiplocele* the symptoms are of a mixed nature, and hence the diagnosis is often more obscure than in either of the other forms of the protrusion. If one part of the tumor feel soft, elastic, and gaseous, and the other doughy, heavy, and nearly incompressible; or if one portion slip up quickly and with a gurgling noise, and the other remain stationary, or is less easily replaced, the presumption will be that it contains both intestine and omentum. Frequently, however, the characteristic symptoms are absent, and the true nature of the swelling can only be determined by the knife.

Reducible hernia, unless very large, is rarely attended with any decided derangement of the general health. Very commonly, indeed, all the functions of the body are well performed. When the disease becomes troublesome, the symptoms usually complained of are, indigestion, flatulence, eructations, colic, constipation, and painful, dragging sensations in the abdomen. The patient, in recent cases, is generally able to move about, and to attend to business, without any particular suffering or inconvenience, even when he does not wear a truss. I have known persons affected with inguinal hernia live in great comfort for years without any mechanical support whatever.

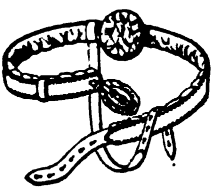
Treatment.—For the reducible hernia, the best remedy is a suitable truss, an instrument designed to answer the purpose of a retentive apparatus. It should be applied as soon as the true nature of the disease has been determined, and worn uninterruptedly until there is reason to believe that the opening of descent has become effectually and permanently closed. Even when this object cannot be expected to be attained, on account of the great size of the aperture, the long standing of the case, and the advanced age of the patient, the viscera should be constantly maintained in their natural position, lest, in an unguarded moment, or in consequence of sudden and violent muscular exertion, recurrence of the rupture should take place, and the protruded parts be strangulated. When the instrument cannot be worn at night, it should always be replaced in the morning before the patient rises, the surface upon which the principal pressure is applied being previously well washed with soap and water, and then rubbed with alcohol, a solution of alum, or some spirituous lotion. Unless these precautions are properly attended to, the skin will be liable to become chafed and covered with boils.

There is no period of life, except that of early infancy, in which a truss, if properly constructed and adjusted, may not be worn with advantage, if not with a prospect of ultimate cure. The only objection to the use of such an instrument in very young children is its liability to chafe the skin, and to become soiled by the excretions, thus imposing a great deal of care and anxiety upon their attendants.

The *trusses* of the present day are, in every respect, very superior to those in use even a quarter of a century ago. The instruments invented by Stagner and Hood, of Kentucky, and afterwards improved by Chase, Dodson, Sheldon, and others, are nearly as perfect as it is possible to make such contrivances. They combine great cheapness and finish with extraordinary lightness and efficiency, and are every way worthy of the favor which they have received in this country and in Europe. The substitution of the wooden block for the soft pads, formerly in vogue, was one of the most valuable additions to the mechanical surgery of the present century. With the old instrument, it was not only frequently difficult to maintain the reduction of the hernia, but such a thing as a radical cure was hardly ever even thought of. The American truss, on the contrary, while it most effectually answers the purpose of a retentive apparatus, often, by the steady, gentle, and uniform pressure of its block, permanently cures the disease.

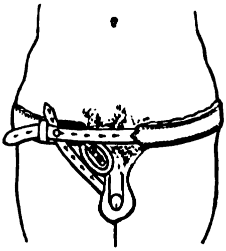
The truss of Stagner and Hood, improved by Chase and others, is represented in fig. 388. The block, composed of beech or cedar, is of a semi-ovoidal shape, convex on its abdominal surface, and flat externally; it is placed more or less obliquely, and is so arranged, in regard to the spring, as to admit of being moved, in order to adapt it more accurately to the part and body. Its great advantages are its uniform consistence and smoothness, its durability, and its inability to imbibe perspiration; qualities which are nearly all wanting in the pads of the older instruments, as well as in many of the modern. The spring consists of a light but strong band of steel, capable of encircling about two-thirds of the body, very flexible and elastic, and thoroughly covered to prevent it from chafing the skin. The leather which surrounds the spring terminates in a free extremity, provided with numerous apertures for fastening it at the other end of the instrument, to a screw just beyond the block. To prevent the truss from slipping up, over the hips, a thigh-strap, also well padded, is attached to it. The adjoining cut, fig. 389, represents the instrument as applied to the body.

Fig. 388.



Truss.

Fig. 389.

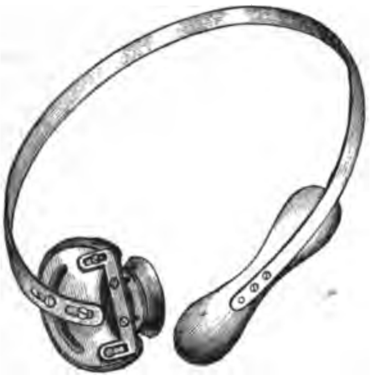


Truss applied.

The number of trusses before the profession is immense; a large volume would hardly suffice to describe and delineate them. The principal differences among them relate to the nature, form, and arrangement of the pad, which, consisting of wood, ivory, glass, lead, India-rubber, or wire, may be circular, oval, oblong, triangular, convex, or cup-shaped. In Marsh's instrument, the pad is composed of half a dozen small, oblong balls, forming a kind of ring. In the Maidstone truss, which has served as a model for many of these modern contrivances, the pad slides on the spring, so as to allow the instrument to adapt itself to the varying movements of the body. In the truss of Salmon and Ody, the pad revolves on a ball and socket. In that of Edwards, it both slides and revolves; and a somewhat similar arrangement exists in the truss of Dr. Sheldon, of New York, which has two pads, both of wood, one semilunar and the other cylindrical, the latter resting partially in the crescentic margin of the former, thus admitting of more concentrated pressure. Sometimes the pad is filled with air, sand, or hair.

The body piece of the instrument also varies a good deal. Thus, the spring occasionally extends entirely round the hips, or, instead of a spring, there is a round wire, as in Newson's truss, or a simple belt, as in the Moc Main truss, or an elastic India-rubber band, as in Bourjeaud's.

Fig. 390.



Sheldon's truss.

The most elegant truss at present manufactured in this country is that of Dr. Sheldon, the inguinal variety of which is represented in fig. 390. The pad, made of boxwood, is of a semicircular shape, and is connected with an oblong compress, composed of the same material, but much smaller, and so arranged as to bear upon the inguinal canal, while the pad itself supports the abdomen above. The spring of the instrument does not differ essentially from that of the more ordinary truss.

It is hadly possible for a person to obtain a well-fitting truss without direct consultation with the manufacturer. This is a matter which is, unfortunately, too much neglected, the patient too often thinking that he can effect by proxy what he ought always to do himself. When the proper examination cannot be made by the cutler, the measure of the body round the hips should be carefully taken with a piece of annealed wire, with an account of the particular form of the rupture, an inch to an inch and a half being allowed for the padding. Every person having hernia should have two instruments of this kind, so that, in the event of accident, he may not be obliged to be without a truss while the broken one is undergoing repair. For want of this precaution, patients have occasionally incurred great risk of life.

For very young children the most suitable retentive apparatus is an India-rubber band and pad, without a spring. Special attention must be paid to cleanliness, and, when the little patient has attained the age of eight, ten, or twelve months, he will generally be able to wear an ordinary truss, provided the spring is not too strong.

The chances of a radical cure by the use of a truss are, other things being equal, always greater in proportion to the small size and recent standing of the hernia, the absence of obesity, and the youth of the patient. When the tumor is large, the probability of effecting the obliteration of the abdominal aperture will be comparatively slight, on account of the difficulty of procuring an adequate supply of plastic matter, and hence few such cases ever thoroughly recover. Under opposite circumstances, on the contrary, the opening is often closed in a short time, for then the parts are more easily influenced by adhesive inflammation, which the steady and persistent pressure of the instrument has a tendency to excite. The sooner, therefore, a truss is applied, the better it fits, and the more steadily it is worn, the greater will be the chances of a speedy and permanent cure. Yet the fact that a rupture is old and bulky should not prevent the use of such an expedient, provided the parts are still reducible; for the efforts of the surgeon are occasionally crowned with success in cases apparently the most unpromising. Should no radical cure follow, the patient will lose nothing by the attempt; but, instead of this, he will be a decided gainer, inasmuch as the tumor will not only not increase under such management, but will be effectually guarded against strangulation. Some difference in respect to the curability of hernia occurs as this complaint manifests itself in different regions of the abdomen. Thus, an inguinal hernia is always more easily relieved than a femoral, umbilical, or scrotal, for the reason, doubtless, that the structures through which the descent takes place are more easily compressed, and, therefore, more easily influenced by exudative inflammation. In young subjects, the probability is that the obliteration of the abdominal aperture is materially promoted by the natural tendency which its margins have to contract. In no instance, perhaps, is there much effusion of plastic matter; certainly much less than is generally supposed. The importance, therefore, of giving early and efficient support, not only to the parts immediately interested in the protrusion, but to the whole abdomen, must at once be obvious, and should receive due attention in every case where the object is to bring about such a result. The efficiency of the truss, in promoting the radical cure of hernia, may be greatly increased, in almost every case, by the use of an abdominal supporter, constructed upon the principle of the instrument employed by women in displacement of the uterus. The weight of the abdominal viscera being thus measurably taken off from the inguinal rings, retention of the bowel is not only much more easily effected, but the edges of the rings are not so likely to be separated, and the adhesions, consequent upon the wearing of the truss, broken up.

Various methods, besides the truss, have been suggested for promoting the radical cure of hernia; of these, some date back to a remote period of the profession, and partake largely of the rude nature which characterized the practice of the older surgeons. To this category belong the operations of excision of the sac, the exposure of the sac and the application of the ligature to its neck, and the incision of the sac and the use of irritants for the purpose of inducing its obliteration; all of which resulted not only in much suffering, but in the loss of many lives. What surprises one is, not that these operations should have been practised in ancient times, but that they should have been repeated at a comparatively recent period. In scrotal hernia, the testicles were often extirpated along with the hernial sac; and so common had this practice become in the seventeenth century that, as Dionis informs us, an itinerant operator was in the habit of feeding his dogs with the organs which he thus removed. Hardly less cruel and unscientific are some of the modern devices for the radical cure of this complaint, especially that of Belmas, which consists in exposing the neck of the sac, and introducing little bladders of gold-beater's skin, with a view of exciting adhesive inflammation.

Gerdy, many years ago, proposed invagination of the common integuments. The operation is principally adapted to the inguinal form of the complaint, and simply consists, as originally executed, in pushing up a fold of skin as far as possible into the neck of the sac, which is then confined there by two points of interrupted suture, introduced by means of a stout, curved needle, through the superimposed structures—muscles, fasciæ, and skin—and separated about one-third of an inch from each other, the ends being tied over a piece of bougie. The pouch of inverted skin is then denuded of its cuticle with spirits of ammonia, which, causing inflammation in the contiguous surfaces, is thus instrumental in gluing them firmly to each other and to the peritoneum.

The operation of Gerdy has fallen into merited neglect; for, independently of the fact that it frequently completely failed, it was not always devoid of danger. Of 62 cases of it, collected by Thierry, 4 are known to have perished, while it is altogether probable that only a few were radically cured. The principles of the operation, however, have been preserved, and have, in a modified form, done good service in the hands of other surgeons.

Another plan, at first sight very specious, but also found, upon trial, to be nearly useless, consists in scarifying the neck of the sac, by means of a delicate bistoury, introduced subcutaneously. Pressure is afterwards made with a truss, to approximate the opposed surfaces, in order to facilitate their union by plastic matter. This operation originated with Guérin.

Acupuncturation for the radical cure of hernia was suggested, in 1836, by Bonnet, of Lyons. It is performed by transfixing the sac with a number of pins, which are permitted to remain until there is ulceration of the skin, compression being exercised in the intervals of the little instruments, for the purpose of promoting adhesive action. Of 11 cases thus treated by Bonnet, 4 were cured, 5 were unsuccessful, and 2 proved fatal; a result sufficient to condemn the procedure.

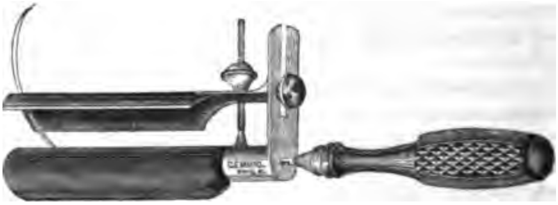
Professor Pancoast has proposed a method of treatment essentially similar to that for the radical cure of hydrocele by injection, consisting of the introduction of some mildly irritating fluid, of which tincture of iodine is, perhaps, the best. The protruded viscera having been carefully replaced, and firm pressure being made upon the hernial aperture, a drachm of iodine is thrown into the sac, and pressed about so as to bring it in contact with every portion of its inner surface. The operation is performed with a delicate trocar, with the point of which the sac is freely scarified before the fluid is forced through the canula. The injection being over, a stout compress is applied over the hernial opening, and unremittingly supported by the pressure of a well-adjusted truss. The iodine is soon absorbed, and a cure is produced by the agglutination of the contiguous surfaces. The operation, which occasionally requires to be repeated a second, and even a third time, must be performed with the greatest care, lest some of the fluid, passing into the abdominal cavity, should cause fatal peritonitis.

Dr. Jameson, of Baltimore, many years ago, performed an operation for the radical cure of a femoral hernia, upon a young lady, by dissecting up a tongue-like flap of integument, from the neighborhood of Poupart's ligament, and inserting its base, which was fully three-quarters of an inch in width, into the femoral canal. The edges of the wound were then drawn together over the flap by several sutures. For a few days the patient was restless and annoyed by vomiting; and, although the parts did not all unite by the first intention, they soon got well, the transplanted integument contracting into a hard knot over the femoral ring, which was thus completely closed, the recovery being perfect.

A very ingenious method of treatment for the radical cure of this affection was proposed by Wutzer, of Bonn, in 1838. It consists in obliterating the sac of the hernia by invaginating a portion of integument, as originally suggested by Gerdy, by means of a peculiar instrument, consisting essentially of three pieces, a wooden cylinder, a curved needle, and a wooden cover, which are retained until the contiguous structures are firmly glued together.

The wooden cylinder is three inches in length, and from three-eighths to three-quarters of an inch in diameter, according to the size of the hernial canal. It is of a somewhat flattened shape, perfectly smooth, and rounded off at the free extremity, a short distance from which, upon its inner surface, is a small opening for the passage of a long, curved needle, which is concealed in its interior, and attached to a movable handle. The cover, also made of wood, is concave on its inner surface, and of the same length and width as the cylinder, to which it is secured by a screw. It also has an opening for the passage of the needle. The accompanying cut, fig. 391, conveys a good idea of this apparently complicated, but really very simple and efficient, instrument.

Fig. 391.



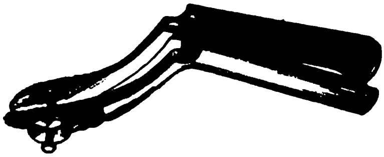
Wutzer's instrument.

The protruded parts having been returned, a fold of integument is pushed up as far as possible into the canal of the hernia with the index finger of the left hand, its palmar surface being directed forwards and upwards. The cylinder, well oiled, is then carried along the cul-de-sac thus formed, guided by the finger, which is gradually withdrawn as the instrument enters. Assuring himself that the extremity of the cylinder is fairly lodged in the internal ring, under the external oblique muscle, as he readily may by observing that it is firmly fixed in its place, the surgeon pushes the needle through the sac of the hernia, the canal, and the integument, and screwing the cover moderately tight upon the skin, he removes the handle of the needle, leaving the remainder of the apparatus upon the abdomen. The protruding portion of the needle is protected with a piece of cork. The principal precaution necessary, in performing this operation, is to see that the cylinder is thoroughly secured in the inguinal canal. In hernia of long standing, attended with unusual laxity of the cellular tissue, it is liable to be pushed up beneath the skin of the abdomen; a circumstance, however, which is always easily detected by the fact that the instrument is more movable than when it is in its proper place.

The apparatus is retained, on an average, from six to eight days, the cover being tightened or relaxed, from time to time, according to the tolerance of the parts, and the amount of the resulting inflammation. The puncture made by the needle generally begins to suppurate about the end of the fourth day. The patient is kept perfectly at rest in the recumbent posture, pain is allayed by anodynes, the bowels are not permitted to move, and the diet is perfectly plain and simple. If peritonitis should arise, which, however, is seldom the case, the symptoms must be met by the ordinary remedies, and all compression be immediately removed. When the apparatus is taken off, the patient must not get up at once, but remain on his back eight or ten days longer; and when, at length, he rises the parts must be carefully supported with a well-adjusted truss, steadily worn for at least six months, lest, the adhesions giving way, the disease should be reproduced.

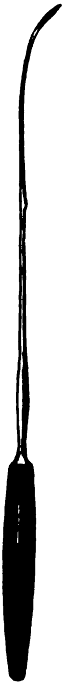
The operation of Wutzer has recently been materially simplified by Dr. Agnew, of this city. The apparatus required for its performance consists: first, of a steel instrument, fig. 392, closely resembling a bivalve speculum, the blades, of which one has two longitudinal grooves, being three inches in length and connected by a hinge near the handle, which is itself controlled by a screw; secondly, of a very long, slender needle, fig. 393, mounted upon a wooden handle, knobbed near its middle, and terminating in a curved point, pierced by an orifice; and, thirdly, of a common stout suture needle, two inches and a half in length.

Fig. 392.



Agnew's instrument for the radical cure of hernia.

Fig. 393.



Curved needle.

The parts being well shaved, and a portion of scrotal integument pushed into the external ring, the instrument, with its grooved blade looking towards the abdomen, is employed to carry, by gentle but steady pressure, the invaginated plug to the upper extremity of the inguinal canal. Holding the parts in these relations, the surgeon now inserts the point of the long needle, armed with a silver wire, into one of the canals of the inner blade, widely separated from the other, and, passing it on, perforates the superimposed structures. The needle, being withdrawn, is then carried along the other gutter, and thence, in like manner, across the tissues, the two punctures being about half an inch apart. In this way the base of the plug is thoroughly embraced by the loop of the wire, the ends of which are next twisted over a roll of lint upon the surface of the abdomen.

The instrument being kept steadily in its position, the sides of the inguinal canal are next approximated by three horizontal sutures, about half an inch apart, the needle, armed with a stout silk thread, being passed between the blades of the cylinder. In this way, all danger of including the spermatic cord and the peritoneum is effectually avoided.

The operation being completed, the instrument is removed, and the patient, rigidly confined to bed, is treated antiphlogistically. The horizontal sutures should not be removed for ten, twelve, or fourteen days, or until there is reason to believe that a sufficiency of plastic matter has been poured out to insure the firm union of the plug. The wire thread may, if necessary, be retained for almost an indefinite period.

Of 140 cases of hernia, operated upon, with slight modifications, according to Wutzer's method, by Professor Rothmund, of Munich, up to 1853, 117 were cured, 4 were ameliorated, 6 were not benefited, and 13 relapsed. Of the latter, some were radically cured by being operated upon a second time.

Of the amount of reliance to be placed upon these statistics, it is difficult to form a correct estimate. Rothmund himself states that many of the patients were lost sight of immediately after the operation, while, on the other hand, the cure in a great number of others was ascertained to be perfect at the end of a year and upwards. In this country, the operation of Wutzer has so signally failed that I am myself unwilling to put much confidence in these assertions.

Professor Armsby, of Albany, has modified the operation of Wutzer by substituting for the needle a single thread, which is introduced, as a seton, through the hernial sac and inguinal canal, by an appropriate instrument, invagination of the integument having previously been effected, as in the other process. The thread being brought out by one end at the upper part of the internal ring, and by the other at the lower part of the scrotum, is occasionally moved, in order to provoke the requisite amount of inflammation. A truss is applied for a few hours immediately after the operation.

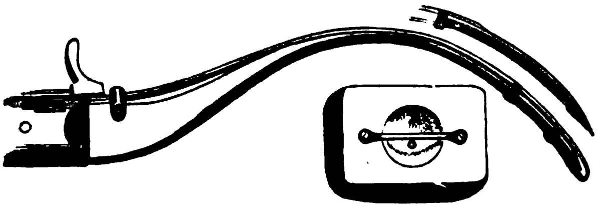
Dr. Riggs has likewise suggested the use of the seton for the radical cure of this disease, but on a larger scale than that recommended by Dr. Armsby. In the New York Journal of Medicine and Surgery, for March, 1858, he described and delineated an ingenious instrument for performing the operation, and gave the results of eight cases, two from his own practice, and six from that of Professor Carnochan, nearly all being successful, without any bad symptoms having followed. Several of the cases were of very long standing.

The operation with the seton was devised by Mösner, by whom, according to Rothmund, it has been performed in 34 cases, with 29 cures, 2 ameliorations, 1 failure, 1 death, and 1 relapse.

In England the most popular operation for the radical cure of hernia seems to be that of Mr. John Wood, of London. The principle upon which it is founded consists in the approximation of the tendinous structures of the hernial canal, and in their close confinement until they are thoroughly united by plastic matter by means of a ligature passed through a puncture in the skin. The operation is thus described by Mr. Druitt, in his excellent Manual of Surgery:—

"An incision about half an inch in length is made through the skin of the scrotum, over the spermatic cord, an inch and a half below the pubic spine. The skin is then separated, by means of a small tenotomy knife, from the subjacent fascia in a circle around this incision, about two inches in diameter. Next the finger is introduced into the wound and made to pass into the inguinal canal. The finger then searches for the arched border of the internal oblique muscle, and is carried behind it towards the linea alba. Then a curved needle, represented in the cut, with its point protected by a tube, is carried up along the concavity of the finger, and made to perforate the conjoined tendon close to the internal ring, and to perforate the skin; but the skin, before perforation, is to be drawn upwards and inwards, so that the outward puncture will be, when the skin is restored to its natural situation, lower and more external than the point where the conjoined tendon is perforated. A thread is now put through the eye of the needle, and the needle withdrawn, leaving one end of the thread projecting. The finger next is made to feel for the external pillar of the ring, and to push the cord downwards out of the way; and the needle is carried along it, and made to pierce Poupart's ligament; meanwhile the skin is moved downwards, so that the needle-point comes out at the first puncture. A loop of thread is left there and held, whilst the needle is withdrawn. The finger is next made to feel for the internal pillar, and the needle to pierce the conjoined tendon, the internal pillar, and triangular ligament, half an inch above the pubes. The point is brought out at the same aperture as before, the end of the thread is pulled out, and the needle withdrawn. The two separate ends of thread which have perforated the internal pillar, and the loop which has perforated Poupart's ligament, are pulled tight, and are passed through a hole in a box-wood pad, and tied over the bar represented above. Thus the inguinal canal is first filled with invaginated fascia and sac; and then its sides are brought together by this subcutaneous suture, so that it is contracted and made to adhere to the invaginated tissues. A pad and bandage are applied, and the ligatures allowed to remain three or four days." In 1863, Mr. Wood stated that he had performed this operation in upwards of 80 cases, of which more than two-thirds had eventuated in a complete cure.

Fig. 394.



Wood's instrument for radical cure of hernia.

The cases best fitted for these various procedures are such as are of comparatively recent standing, and unaccompanied by any great bulk of the tumor. When the canal is much diminished in length, and increased in diameter, as generally occurs in old ruptures, in which the orifices of the canal are on the same line, and immediately above each other, a cure will generally be impracticable by any method whatever. To femoral, umbilical, and ventral hernias, these procedures are not adapted, owing to the great risk of peritonitis and extensive suppuration.

In a case of hernia, consequent upon a wound of the abdomen, in a young man, about thirty years of age, I succeeded in effecting a very excellent cure by cutting down upon the parts, and closing the opening with four interrupted silver sutures, carried through its muscular edges, previously well pared, as in hare-lip. The operation, performed in December, 1858, at the clinic of the Jefferson College, was unattended by a solitary unpleasant symptom. In a case of large, old scrotal hernia, in a man sixty-two years of age, upon whom I operated in 1861, in a similar manner, at the Philadelphia Hospital, the cure was equally perfect, although the parts had been seized with an alarming attack of erysipelas.

In the New Orleans Journal of Medicine for March, 1859, Professor T. G. Richardson suggested the propriety of treating inguinal hernia by means of the silver wire suture, introduced subcutaneously The idea is certainly ingenious, and will no doubt receive due attention. It is easy, however, to suppose that the operation must often fail for the want of a sufficiently abundant plasma, and on this account direct incision would probably be preferable.

Spontaneous Cure.—A hernia occasionally gets well spontaneously. Such an event is, of course, most likely to occur in very young subjects, in whom the opening in the walls of the abdomen, whether natural or artificial, is very small. I recollect an instance, however, in which a very rapid cure took place, where the aperture was of immense size. The patient, an infant, three weeks of age, had a tumor in the right groin, fully equal to the volume of an ordinary adult fist. The parts being replaced, the abdomen was supported with a compress and a broad flannel bandage, after which no further protrusion occurred. I have met with several cases in which ruptures of considerable size were permanently cured during severe illness, necessitating long confinement in the recumbent posture. The flaccid condition of the bowels attendant upon such cases leaves the walls of the abdomen comparatively free from pressure, and thus places the hernial apertures in a situation highly favorable to contraction and ultimate obliteration. In umbilical rupture, a spontaneous cure is by no means uncommon, owing to the natural disposition of the ring to close.

Sometimes a radical cure is effected by the interception of a portion of omentum in the opening of descent. I have witnessed this occurrence both in scrotal and femoral hernia, and there is no doubt that it may also happen in the inguinal and umbilical varieties of the complaint. The plug which is thus formed contracts permanent adhesions to the opening, so as effectually to prevent any farther protrusion. Some years ago a young man consulted a surgeon on account of a small tumor in the right groin, a short distance below Poupart's ligament; it was free from pain, about the size of an ordinary marble, and of several years' standing. Under a belief that it might grow, and ultimately cause trouble, it was removed. A careful dissection showed that it was nothing but a mass of omentum, firmly adherent to the edges of the orifice of an old rupture. The operation was speedily followed by a redescent of the viscera.

2. IRREDUCIBLE HERNIA.

An irreducible hernia is one in which the protruded parts do not admit of replacement. Various causes may conspire to produce such a result. Some of these causes are altogether of an adventitious character; others relate to changes experienced by the prolapsed structures, in consequence of their long sojourn on the outside of the peritoneal cavity; and others, again, depend upon the condition of the edges of the opening, whether normal or abnormal, at which the hernia has occurred. Finally, the difficulty may exist on the part of the peritoneal cavity. These causes are of great practical importance, and, therefore, demand separate consideration.

Under the first head of causes, here designated as the adventitious, may be enumerated the adhesions which are so liable to form between the hernial sac and its contents. These adhesions, which are always the direct result of inflammation, are of variable firmness and extent, according to their duration and the amount of plastic effusion. Sometimes all the protruded structures are united, not only to each other, but to the walls of the sac; but, in general, certain portions are free, while the remainder are more or less adherent. Occasionally distinct bands are seen stretching from one coil of intestine to another, or from a portion of bowel to a portion of omentum, or, finally, from the prolapsed parts to the surface of the hernial sac. In ancient cases the plastic matter often presents itself in the form of cellular tissue, as, under corresponding circumstances, it does in the pleura and peritoneum.

Secondly, a hernia may be rendered irreducible by the alterations experienced by the protruded structures themselves from interstitial deposits. The omentum is remarkably prone to become hypertrophied from protracted residence on the outside of the abdomen, and similar changes, though not in the same degree, are liable to occur in the bowels. The parts being thus enlarged, perhaps several times beyond their normal volume, are finally rendered incapable of being restored to their original situation. Another cause of the irreducibility of a rupture, but one usually of a more transient character, is the impaction of the bowel with fecal matter, gas, worms, alvine concretions, or some indigestible substance. Sometimes, again, a hernia, originally reducible, may be rendered irreducible by the manner in which the prolapsed parts, especially if consisting of intestine and omentum, are twisted round each other.

Thirdly, the cause of the difficulty may exist in the opening in the wall of the abdomen, the margins of which may either contract, and thus prevent the return of the protruded parts; or the orifice may retain its original dimensions, and yet, in consequence of the changes experienced by the contents of the tumor, the hernia may be rendered irreducible. The whole difficulty, in either case, evidently depends upon a loss in the relative size of the parts concerned in the disease.

Finally, the irreducibility of the hernia may depend upon the contraction of the peritoneal cavity, or an unwillingness, so to speak, on the part of this cavity, to reclaim its original possessions. Such an occurrence is very likely to happen in very large and old ruptures, embracing an unusual quantity of bowel and omentum, or of bowel and some solid viscus, as the liver, spleen, or uterus. The parts having resided for a long time in their new situation, are found, when an attempt is made to restore them to their former position, to be too bulky for the now contracted size of the abdominal cavity.

The above causes, excepting the first, are generally tardy in their operation, and hence a considerable period often elapses before the protruded structures become finally irreducible. When inflammation is set up in the sac, or in the prolapsed parts, whether accidentally or otherwise, a hernia may be rendered irreducible in a very few days. The varieties of rupture most liable to this occurrence are the scrotal and umbilical.

Persons affected with irreducible hernia are subject to habitual derangement of the digestive apparatus, especially to flatulence, eructations, acidity, nausea, colicky pains and constipation of the bowels. The size of the tumor varies; it often remains stationary, or nearly so, for years, but in the end it is sure to increase, and frequently attains an enormous bulk.

When a hernia has been long irreducible, it may, especially if unusually bulky, or improperly treated, cause serious irritation both in the sac and in the neighboring parts. Such an effect will be more likely to follow, other things being equal, when the contents of the rupture are composed of omentum than when they consist of intestine, owing to the fact that the former, gradually yielding to the pressure so incessantly exerted upon it, is apt to become not only greatly hypertrophied, but completely metamorphosed in its structure, thus unfitting it for safe companionship. More than one instance has been known where such a state of things has caused death by ascites or suppuration, the inflammation extending from the sac and the protruded omentum to the peritoneum or to the omentum within the abdomen.

Treatment.—In the treatment of irreducible hernia three prominent indications are presented: first, to render the affection, if possible, reducible; secondly, where this cannot be done, to prevent its increase; and, thirdly, to palliate the suffering caused by the confined and compressed condition of the displaced parts.

The probability of a successful fulfilment of the first indication will depend materially upon the circumstances of each individual case, and cannot, therefore, be stated with any degree of precision. The most important of these circumstances are, the size and age of the hernia, and the condition of the general health. A small tumor will, other things being equal, be more likely to become reducible than a large one, and one of recent standing than one that is old. Indeed, it is questionable, when the tumor is very bulky, whether its contents ought to be returned, supposing that they could be disengaged, on account of the injurious impression which they would create in the abdominal cavity, which, in consequence of their long absence and great size, would be little disposed to accommodate itself to their presence, or provide for them a new home. The chances of a fortunate issue will also be greater in a sound than in a sickly person, the function of absorption, upon the vigorous execution of which the favorable result essentially depends, being always performed more energetically in the former than in the latter. The measures best calculated for fulfilling this indication, whether the cause of the non-reducibility be hypertrophy or adhesion, are, rest, recumbency, low diet, venesection, purgatives, mercurials, and sorbefacient applications.

Without repose in the recumbent posture, absolute, steady, and protracted, no course of treatment, however judiciously conducted in other respects, will be likely to prove of the slightest avail. The diet should be non-stimulant, farinaceous, and barely sufficient to support life; it should be low in the broadest sense of the term. If the patient is young and robust, the treatment may be commenced with the abstraction of from sixteen to twenty ounces of blood, to be repeated afterwards to one-half, one-third, or one-fourth of that extent every eight, twelve, or fifteen days, until the patient is so far drained of fluids as absolutely to forbid any further depletion. In old and enfeebled subjects, the lancet must either be withheld entirely, or used with much caution. Purgatives will be of the greatest benefit throughout the whole course of the treatment, whether short or protracted, or whatever may be the condition of the patient in other respects. They not only unload the bowels, and thus prevent fecal accumulation in the protruded viscus, but they aid in equalizing the circulation, and in promoting absorption. The best articles are compound extract of colocynth, jalap, and blue mass, in doses sufficiently large to produce one or two efficient motions, and repeated every third, fourth, or fifth night. Their action may, if necessary, be assisted by enemata or saline laxatives.

As soon as the system has been properly prepared by diet, venesection, and purgatives, the patient should be subjected to the use of mercurials, such as calomel, blue mass, or corrosive sublimate, with a view to gradual ptyalism, which should be steadily, but cautiously, continued for many weeks. Such a course is always equally indicated, whether the cause of the irreducibility of the hernia be hypertrophy or adhesion of the protruded viscera. The manner in which it proves beneficial need not be pointed out here, as it has been explained elsewhere. Along with the mercurials might be used, more or less freely, the iodide of potassium, and hydrochlorate of ammonia, alternately every other week, in doses varying from eight to fifteen grains thrice a day.

As it respects the local treatment, the first thing to be done is to suspend the tumor by means of an appropriate apparatus, so that it may receive no injurious impulse from coughing, straining, or other muscular exertion. This point being attended to, sorbefacient lotions are diligently applied, as solutions of acetate of lead, Goulard's extract, or, what is better, hydrochlorate of ammonia. Various stimulating liniments and unguents may also be used, especially after the case has been for some time under treatment. Occasionally steady, systematic compression answers a good purpose; maintained either with adhesive strips, as in the treatment of subacute orchitis, or by means of a truss with a hollow pad, progressively lined with layers of leather, or furnished with a gum-elastic air cushion.

It is impossible to say how long, in any given case, this mode of treatment should be continued, before its good effects will become apparent, or before we can determine the probability of its inutility. In the few cases in which I have employed it, it was extremely difficult to secure the hearty co-operation of the patient beyond six or eight weeks. This plan of management, it will be perceived, is similar to that of Valsalva for the radical cure of aneurism, and was doubtless originally suggested by the circumstance that, during protracted illness, an irreducible hernia has occasionally disappeared spontaneously, the protruded viscera having become disengaged from their sac, or having drawn the sac along with them into the abdominal cavity.

When the case is hopelessly irreducible, all that can be done is to support the parts in such a manner as to prevent their further descent, and, at the same time, protect them from injury. When the tumor is small the best contrivance is an ordinary spring truss with a hollow pad, made either of metal, gutta-percha, or unoiled sole-leather, its interior being well padded with buckskin, or some other soft, pliant material, to protect the surface from undue pressure. Such an apparatus will answer nearly equally well for all varieties of irreducible hernia, whether inguinal, femoral, umbilical, or ventral. When, on the contrary, the tumor is very bulky, the gum-elastic suspensory takes the place of the hollow truss, as better adapted to sustain the heavy and pendulous mass. As now manufactured in our larger cities, it is difficult to imagine anything of the kind more perfect, comfortable, and convenient. It is incomparably superior to the numerous and clumsy contrivances so much in vogue a few years ago. The suspensory, while it may be readily adapted to all the varieties of irreducible rupture, is particularly applicable to the scrotal, the descent of which it is well calculated to restrain by the steady and uniform compression which it exercises upon the pendulous tumor.

The colicky pains, dragging sensations, and dyspeptic symptoms, so common in persons laboring under irreducible hernia, are best relieved by attention to the diet and bowels, and the avoidance of severe muscular exertion. The food should be plain, simple, and concentrated, comprising the greatest possible amount of nutriment in the smallest possible space; acidity and flatulence should be remedied by alkalies, especially the bicarbonates, carminatives, and tonics; and the bowels should be maintained in a soluble state by some mild vegetable pill, or the saline cathartics. In short, the patient, while he should consider himself constantly as an invalid, should do everything in his power to keep his health as near as possible at the normal standard; neither starving himself, on the one hand, nor indulging in any excesses, on the other.

Inflamed Irreducible Hernia.—An irreducible hernia, particularly if it be one of large size, may occasionally be assailed by inflammation, brought about either by external violence, or by the inordinate accumulation of irritating fecal matter in the incarcerated intestine. The symptoms denotive of the occurrence are generally those of an ordinary circumscribed peritonitis; hence, unless the case is carefully investigated, it might very readily be mistaken for one of strangulation. The attack is usually announced by pain and tenderness in the parts, attended with a sense of weight and tension, but without any marked increase in the size of the tumor. The skin soon becomes hot, if not also discolored, and there is occasionally a good deal of œdema. The constitutional involvement is seldom considerable, unless, as sometimes happens, there is a tendency to the formation of a stercoraceous abscess, when it will, of course, be proportionately severe. Vomiting now and then takes place, more especially in the earlier stages of the attack, generally as a consequence of the presence of irritating ingesta, as if nature were desirous of relieving herself in this way, but the matter ejected is never feculent, and this fact, coupled with the circumstance that the patient, although laboring under constipation, is still able to pass flatus and fluid feces, is usually sufficient to distinguish the complaint from strangulation Moreover, in inflamed hernia, the ring is generally free from tension, and the pain is always referred, in the first instance, to the body of the tumor, whereas, in strangulation, it is originally most severe at the site of stricture.

The *treatment* must be conducted upon general antiphlogistic principles; by rest and elevation of the parts, the application of leeches, anodyne and saturnine lotions, laxative injections, and strict abstinence. Purgative medicine is carefully avoided, and it may even be necessary to control the action of the bowels with opiates, in the same manner as in ordinary peritonitis.

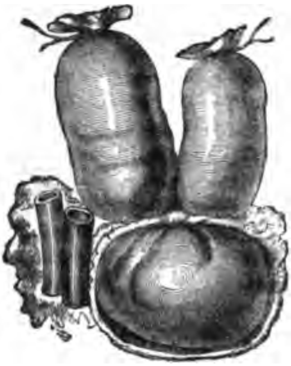
Obstructed Irreducible Hernia.—Another source of trouble in irreducible hernia is obstruction from the accumulation and impaction of fecal matter and flatus. The occurrence is most common in large ruptures of old subjects, and may exist independently of inflammation and strangulation, although both may ultimately supervene, especially if the parts be subjected to rough manipulation in the employment of the taxis. The immediate cause of the obstruction is usually some adhesion between the protruded structures and the sac, leading to the formation of an elbow or angle in the incarcerated bowel at variance with the propulsion of its contents, or, what is the same thing, their return into the abdomen. The most prominent symptoms are colicky pains, flatulence, constipation, and irritability of the stomach, with occasional vomiting of ingesta, or ingesta, bile, and mucus. The tumor is generally free, at least for a considerable length of time, from pain and tension, although it may be somewhat tender on pressure.

The *treatment* may be commenced with a stimulating enema, as, for example, a mixture of turpentine and castor oil, to clear out the lower bowel. The fluid may, if necessary, be introduced with the gum-elastic tube. When this object has been attained, recourse may be had to the taxis, in the hope of being able to empty the obstructed intestine of feces and flatus, the patient being at the time under the influence of chloroform. If the success attending the operation is only partial, a brisk purgative may next be administered, and if this also should fail, the knife must be used.

3. STRANGULATED HERNIA.

Strangulated hernia is that form of the disease in which the protruded parts are firmly, painfully, and injuriously compressed by the edges of the opening at which the descent has taken place, or at the neck of the sac, as seen in fig. 395. Sometimes, however, the constriction occurs at the mouth of the sac, in the interior of the sac, or between the prolapsed structures themselves. Thus, a protruded bowel has occasionally been strangulated by being tightly wrapped up in a piece of omentum, or by being forced through a fissure in the substance of the omentum.

Fig. 395.



Strangulated hernia.

It is not often that a recent rupture is exposed to the danger of strangulation; in general, it is only when the parts have been seriously changed by interstitial deposits, or, in other words, when the hernial canal and rings have become greatly contracted or the protruded structures have disproportionately increased in bulk, that such an event is likely to occur. Of 100 cases of this disease, analyzed by Mr. Wilkinson King, of London, the mean duration of the rupture in 61, prior to the supervention of strangulation, was about twenty years; whilst out of 98 cases, 94 were in various degrees "old" before this occurrence.

Recent ruptures, however, especially if small, are, other things being equal, remarkably prone to be attended with violent suffering when strangulation occurs. In such an event, too, the danger both to the part and system is always much greater when the strangulation is not promptly relieved than in hernias of large size and of long standing, for the reason that the constriction is usually more severe in the former than in the latter, and, therefore, more liable to be followed by mortification. The varieties of hernia in which the strangulation is commonly most violent and hazardous are the femoral and concealed inguinal; both usually of small size, and for this reason, unfortunately, apt to be overlooked. Sometimes, indeed, the stricture includes only a very small portion of the bowel, not enough, perhaps, to form the slightest appreciable external tumor.

Strangulation commonly takes place suddenly, in consequence of some violent muscular exertion, as in leaping, running, lifting, or coughing. However induced, the person is soon rendered conscious of the occurrence by the tender state of the tumor, and by a sense of general uneasiness in the abdomen. Gradually, perhaps rapidly, the suffering increases; the parts become exquisitely painful, both at the site of the swelling and for some distance around; the slightest touch even of the finger is frequently intolerable; a feeling of constriction, as if a cord were stretched tightly round the belly, is often complained of; the patient lies upon his back, with the knees retracted and the shoulders elevated, in order to relieve the parts as much as possible of their tension; there is more or less restlessness, and even jactitation; the pulse is frequent, hard, and wiry; the mouth is dry, the thirst urgent, the surface hot, the countenance flushed, and the head oppressed with pain. By and by nausea and vomiting occur, at first of ingesta, then, perhaps, of bile and mucus, and finally of stercoraceous matter; hiccup now sets in, and twitching of the tendons soon becomes a prominent symptom. The mind wanders, sometimes even at an early stage, and not unfrequently there is low, muttering delirium. The bowels are usually obstinately constipated from the first, or, if there is any alvine discharge, it is derived entirely from the part of the bowel below the seat of the mischief. If, when the case has reached this crisis, prompt relief is not afforded, another series of changes occurs, still more striking and portentous. The countenance now assumes that peculiar shrunken aspect, so well described by Hippocrates, and hence usually called by his name; the tongue is dry, tremulous, and unable to protrude itself; the gums and teeth are incrusted with sordes; the surface is covered with clammy perspiration; the extremities are icy cold; the tumor, of a livid color, crackles under pressure; and the patient is in a state of the utmost exhaustion, unable to answer any questions, or to maintain himself upon his pillow. The pain, previously complained of, has suddenly ceased, and the poor sufferer, if not wholly unconscious of his condition, perhaps flatters himself that he will soon be well, when, in fact, he is in the very jaws of death. Mortification of the protruded parts has taken place, and his only hope of safety is in the formation of an artificial anus. The period at which death occurs varies, on an average, from three to five days, being generally earlier in strangulation of small and recent hernias than in large and old.

The symptoms of strangulation, especially in its earlier stages, are not always as urgent as they are here represented. Sometimes, indeed, they are exceedingly mild, even for several days, when, perhaps all of a sudden, they become greatly aggravated, and denotive of the worst consequences. It is worthy of remark, too, that they are usually more severe in strangulation of the bowel than in strangulation of the omentum, though not as much so as is commonly supposed.

The *diagnosis* of strangulated hernia may usually be readily determined by the history of the case, a thorough examination of the abdomen, especially of those regions which are most liable to visceral protrusions, and a careful consideration of the constitutional and local phenomena. There is always a partial, and, when the stricture is very tight, a complete interruption between the sac and the general peritoneal cavity; and hence, if the patient is requested to cough, while the fingers are pressed upon the tumor, no impulse will be imparted to them. Moreover, if the tumor is grasped firmly with one hand, and alternately squeezed and relaxed, while the index finger of the other hand is placed upon the neck of the hernia, opposite the seat of the stricture, the impulse produced by the compression will cease abruptly at the seat of the obstruction, owing to the fact that the contents of the sac cannot be forced farther on, as happens when the communication remains free. The chief difficulty in regard to the diagnosis of strangulated hernia arises from the circumstance that there is occasionally no external tumor whatever, or, if a tumor is present, that it is impossible to determine whether it is a hernia, an incipient abscess, or an inflamed lymphatic ganglion. Besides, it should not be forgotten, as will be shown by and by, that all the symptoms of strangulated rupture are sometimes most painfully simulated by various internal affections, as intussusception of the bowel, or strangulation of the bowel and omentum by bands of false membrane. The mere mention of these facts should be sufficient to impress upon the mind of the surgeon the importance of increased vigilance in his examinations of all doubtful cases of this kind, as everything may depend upon a correct diagnosis.

The attention of the surgeon should be particularly aroused if the patient is suddenly seized with obstinate vomiting, attended with constipation, and speedily followed by excessive prostration, pain in the bowels, tenderness of the abdomen, and a pinched and anxious expression of the countenance. Such symptoms should always excite a suspicion of the existence of a hernia, and, therefore, no time should be lost in exploring every region of the body in which this affection is liable to show itself. The inguinal and femoral rings, the umbilicus, and the linea alba, in particular, should always be most carefully scrutinized, as they are the most common sites of rupture. If the local distress is very circumscribed, and there is a tumor, small, tense, and very tender, the probability is that the disease is a hernia, and nothing else.

Sometimes a tumor and a hernia coexist. Such an occurrence is most liable to take place in the groin, in consequence of enlargement of a lymphatic ganglion. Thus, great embarrassment may arise, the surgeon, perhaps, finding it very difficult what to do; but the invariable rule in such a case is to operate, no particular harm accruing if the enlargement is a common tumor, whereas if it is a strangulated rupture, the patient might perish from neglect of proper treatment.

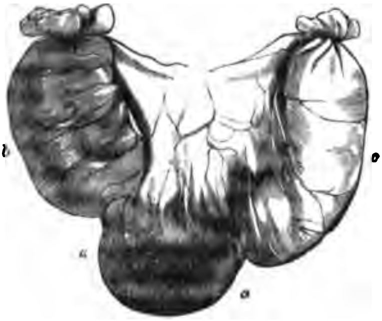
Doubt in regard to diagnosis may arise when a man, long the subject of hernia, is affected with vomiting and spasm of the bowel, attended with constipation, and is found, upon examination, to have a tumor in the abdomen, the hernia itself being perfectly reduced. Here the enlargement will probably be due to circumscribed fecal distension of the intestine, upon relieving which the symptoms will subside; or it may be caused by disease of the omentum, spleen, liver, or ovary, in general easily distinguishable from rupture.

The symptoms of intestinal strangulation may be closely simulated by colic, enteritis, or peritonitis supervening upon an irreducible hernia. When the pain begins in the neck of the sac, and is particularly intense there, the probability is that it is due to strangulation; whereas, if it be unduly diffused, it may be inferred that it is owing to some other affection. In doubtful cases the rule is to operate.

Finally, a man may have a double hernia, and, symptoms of strangulation arising, doubt may ensue as to the precise seat of the disease. Under such circumstances the rule is to operate first upon the tumor that is the more tense, tender, and painful, and afterwards, if necessary, upon the other.

Dissection of the body after death from hernia reveals, in general, nothing but the ordinary evidences of peritonitis. The protruded parts are in a state of the most profound vascular engorgement, livid, purple, or claret in color, and incrusted with plastic matter, as in fig. 396. If gangrenous spots exist, they are easily recognized by their greenish or blackish hue, and by their soft consistence. At the seat of the stricture the bowel is usually ulcerated, or pierced with apertures, commonly so small as hardly to admit even of the escape of gas, much less of mucus and feces. Occasionally the only morbid change there is a ring-like groove in the walls of the intestine. The sac, participating in the morbid action, generally exhibits strong traces of inflammation. On laying it open there is almost always an escape of serous fluid, varying much in quantity and color in different cases, and under different circumstances. While it is seldom entirely absent, in any instance, it rarely exceeds half an ounce or six drachms, the average ranging from one and a half to two drachms. Its color is at first like that of water, but as the strangulation advances it is rendered red, dark, or purple, from the admixture of hematin. Occasionally the sac contains pure blood, but this is unusual. The external investments of the tumor are more or less congested, discolored, and, when the mortification has extended also to them, emphysematous, from the extrication of gas.

Fig. 396.



Strangulated bowel. *aa.* The constricted portion; *b.* The cardiac portion, dilated, and of dark color; *c.* Lower portion, nearly empty, flaccid, and pale.

The general peritoneal surface also exhibits traces of the effects of the strangulation, being always most distinct at and immediately around the seat of the constriction. The affected parts are variously discolored, incrusted with lymph, and here and there adherent. Occasionally the cavity of the serous membrane contains a small quantity of altered serosity.

If the patient survives the effects of the mortification, the superincumbent structures of the hernia slough away, and the dislocated bowel being also opened, an artificial anus is established, admitting thus of the discharge of fecal matter along the upper portion of the tube; while that which intervenes between the accidental and natural outlets, gradually unburdening itself of its contents, sinks into a state of collapse.

Treatment.—For the relief of strangulation, various means are at our command, all resolving themselves into the one great and important element of an early and effectual reduction; for it must be evident that there can be no safety, either for the parts or the patient, so long as the protruded viscera are permitted to remain in their constricted condition. The sooner, therefore, an attempt is made to restore them to their natural situation, the greater will be the chance of preventing inflammation, so much to be dreaded in all cases of this kind, because it constitutes the chief source of danger. The period at which inflammation supervenes after the occurrence of strangulation varies from a few hours to several days, depending mainly upon the nature of the protrusion, the character of the stricture, and the state of the system. As a general rule, it may be assumed that the occurrence will be early in direct ratio to the small size and recent standing of the hernia, the firmness of the parts opposing restoration, and the robustness of the patient. Once begun, the inflammation may proceed with great rapidity, involving not only the whole of the protruded viscera, but extending, on the one hand, to the general peritoneal cavity, and, on the other, to the various coverings of the tumor. Hence, no one can doubt the propriety of early restorative interference.

The means that are employed for effecting the reduction of the strangulated parts constitute what is called the *taxis*, a Greek term, signifying to set in order, or to restore what has been deranged. It has reference merely to certain manual efforts at replacement, which should always be tried before we resort to the knife. The only exception to this rule is where the strangulation has existed so long, and the symptoms, local and constitutional, are so urgent, as to render it probable that, if practised, the protruded structures would suffer serious detriment. In such a case the best taxis is the knife.

In order to impart thorough efficiency to the taxis, it is necessary, first, to evacuate the bladder, and also the rectum, provided it is much distended; secondly, to relax the abdominal muscles; and, thirdly, to use certain adjuvants, as chloroform, venesection, and external applications. The first of these objects is attained by the patient's own efforts, or, if necessary, by the catheter, and by a slightly stimulating enema; and the second, by placing the patient upon his back, and elevating the head and shoulders, the thighs being bent nearly at a right angle with the trunk, and held close together by an assistant, with the toes somewhat inverted. In most cases, if, indeed, not in all, great advantage will be derived from putting a pillow under the buttocks, so as to lift up the pelvis. In this manner, the points of attachment of the abdominal muscles being made to approximate each other, the greatest possible degree of relaxation will be secured; a circumstance of paramount importance in all such proceedings. The third indication is fulfilled by the administration of chloroform, carried to the extent of complete obliviousness. The part and system being thus thoroughly relaxed, the surgeon, standing, sitting, or kneeling, as may be most convenient, at the right side of the patient, as he lies upon the edge of the bed, the sofa, or the floor, grasps the tumor with the right hand, and draws it carefully downwards towards himself, to disengage the protruded parts from the neck of the sac, and at the same time give them the proper direction in relation to the outlet of the opening or canal through which they descended. This being done, he exerts gentle, uniform, and steady pressure upon it, to force out its contents, the left thumb and index finger being applied to the upper part of the tumor for the purpose of fixing it at that point, and thus promoting the reduction. If the hernia is very large, the manipulation is performed with both hands, with a degree of caution the greater as the force will now be likely to be more considerable. In a few minutes—perhaps only a few seconds—after the pressure has been applied, the operator will generally be conscious of a slight noise, as well as of a slight diminution of the tumor, caused by an escape of gas, and, perhaps, also of fecal matter. Steadily continuing his efforts, he finds that one portion after another of the protruded parts goes up, the last usually with a distinct gurgling sound, until the sac is completely emptied of its contents. Sometimes the most trifling pressure is sufficient for the replacement, while at other times a large amount is necessary. When the hernia consists both of bowel and omentum, the former generally ascends before the latter, though in this respect there is not a little diversity in different cases.

The length of time during which the taxis should be continued must vary according to circumstances; in general, an old hernia will, when strangulated, bear pressure much better, and also for a longer time, than a recent one, and a large than a small one. Much will likewise depend upon the amount of inflammation that may be present in the protruded viscera, the parts being always most tolerant of manipulation when this is slight, or when it exists only in a moderate degree. Then, again, a good deal will depend upon the peculiarity of each individual, one person enduring pain much better than another, although the bowel and omentum may be equally severely compressed in both. When the symptoms are urgent, it is a good rule not to continue the efforts at the taxis beyond ten, twelve, or, at most, fifteen minutes, but to proceed at once to an operation, or, what is preferable, to administer a full anodyne, and cover the tumor with some refrigerant lotion. At the end of some hours, the manipulations may be renewed, and now, perhaps, with a better prospect of success, seeing that the parts have had time to become soothed and relaxed. These attempts, however, also failing, the operation should be commenced without delay.

The taxis may be aided, in addition to chloroform, by venesection, the warm bath, anodynes, and various external applications.

Venesection, carried to the extent of partial syncope, has generally been viewed as one of the most valuable auxiliaries of the taxis. The blood should be drawn in a full stream, while the patient is in the erect or semi-erect posture, the object of the operation not being spoliative, but exhaustive. Thus performed, it seldom fails to relax the abdominal muscles, to reduce the tumor, and to prevent or relieve inflammation. Bleeding, however, is not to be resorted to indiscriminately; for, while it is exceedingly important in small and recent hernias, occurring in young, robust subjects, with a strong, hard, and frequent pulse, and great tenderness of the abdomen, it is altogether inadmissible in protracted strangulation, or in aged and debilitated persons. A small, rapid, and wiry pulse, so characteristic of peritonitis, does not contra-indicate venesection, unless there is other evidence of prostration, as coldness of the extremities, profuse perspiration, and collapse of the features. In my own practice, a resort to bleeding, as an auxiliary of the taxis, has been exceedingly uncommon, chloroform having afforded me all the aid that could be desired. When the parts are much inflamed, blood may sometimes be advantageously taken from the tumor by leeches.

The *warm bath* is used nearly with the same view as venesection, to depress the system, and induce relaxation of the abdominal muscles. The temperature, at the moment of the immersion, should be about 90° of Fahrenheit, from which it should be gradually raised to 110°. As soon as a disposition to faintness is felt, the taxis is renewed, and is then often successful, especially if aided by anæsthesia. Owing to the inconveniences attending its use, the warm bath is rarely employed in private practice, and perhaps this is well, for there is certainly not much sense in parboiling a man when he can be so easily relieved with the aid of chloroform.

Among the adjuvants of the taxis, *anodynes* hold deservedly a high rank. They sometimes succeed when everything else fails. They relieve vomiting, diminish the morbid sensibility of the tumor, tranquillize the system and induce sleep, during which the reduction of the hernia is occasionally effected as if by magic. They should be given in full doses, either in the form of morphia, opium, or laudanum, according to the judgment of the practitioner. When they cannot be taken by the mouth, they should be administered by the rectum, which, indeed, is sometimes the preferable mode. In this way, I have repeatedly succeeded in effecting the reduction of a strangulated hernia, with the greatest facility. A good rule is, when the symptoms are not urgent, and especially when the patient is averse to the use of chloroform, to give four grains of opium, and, if the parts do not return of their own accord during the resulting sleep, to employ the taxis within from four to six hours afterwards, or before the effects of the medicine have begun to pass off. It has happened, more than once, that a strangulated hernia, upon which the taxis had been tried in vain, has spontaneously disappeared during a natural sleep, much to the discomfort of the ever-ready knife's-man.

No educated surgeon at the present day would think of employing *tobacco* and tartar emetic, as auxiliaries of the taxis. Fortunately this practice, which numbers many victims, has either become obsolete, or is rapidly tending that way. Prior to the discovery of chloroform, as an anæsthetic agent, there was some excuse for the use of these potent remedies; certainly none exists at the present day.

The employment of *purgatives*, too, cannot be too pointedly condemned, inasmuch as they are liable to cause vomiting and griping, and, by propelling the contents of the bowel against the strangulated portion of the tube, distension and inflammation of the canal above the seat of the stricture. In omental rupture they cannot exert the slightest agency in extricating the protruded mass. Some benefit may be expected, especially in large and old hernias, from stimulating injections, as castor oil and turpentine, or senna and salts, used copiously by means of a gum-elastic tube carried high up the rectum. The peristaltic action thereby induced unloads the large intestine, and occasionally draws the strangulated portion of the canal into the abdominal cavity.

Applications made directly to the tumor and the parts immediately around are sometimes beneficial, both in effecting relaxation and relieving inflammation. With this view two classes of remedies, very opposite in their character, may be used, namely, cold and warm. Respecting their relative merits, it is impossible, in the existing state of the science, to form any accurate opinion. It is certain that they are not both equally applicable in all cases or in all circumstances. The best plan, undoubtedly, is to be governed, at least in some degree, in their employment, by the feelings of the patient, or the tolerance of the part and system. As a general rule, it will be found that cold applications will be borne best by the young and robust, and in cases of recent standing, whereas warm will be most agreeable when the patient is delicate and nervous, or old and feeble.

I have myself always derived most advantage from cold, applied by means of a small bladder partially filled with pounded ice, or a refrigerant lotion, composed of equal parts of alcohol and water, or a strong solution of nitrate of potassa and hydrochlorate of ammonia. When a sudden and powerful impression is desired, the tumor may be covered with a thin sponge, saturated with ether, or it may be irrigated with cold water, poured from a pitcher, or thrown upon it with a large syringe. Injections of ice-water might also be tried with a prospect of success. The external application of cold must not be too prolonged, as it has sometimes been followed by gangrene, especially in the aged and infirm. However employed, it seems to do good by diminishing the congestion in the vessels of the tumor, allaying morbid sensibility, moderating the tendency to inflammation in the protruded parts, relaxing the stricture, and, perhaps, also condensing any gas that may exist in the strangulated bowel.

Warm applications are particularly soothing and useful when there is inordinate sensibility in the tumor and abdomen, along with an irritable state of the system and a disposition to nausea and vomiting. They may consist simply of water, or, what is better, of water and laudanum, kept constantly upon the parts by means of a large, thick flannel cloth, covered with oil-silk, and renewed at least every half hour, care being taken always to have a fresh cloth ready the moment the previous one is removed. Warm applications relieve soreness and pain, and, if properly employed, relax both the parts and system, often inducing tranquil sleep and copious perspiration, during which the bowel has been known to return spontaneously into the abdominal cavity.

Although I am in favor of these applications in the milder forms of strangulated hernia, I should be very loth to employ them when there is the least urgency, or when the symptoms are such as to render the further postponement of the knife a matter of doubt. It should be remembered that they are at best merely adjuvants, and that by continuing them too long most valuable time may be lost. If, therefore, very decided amelioration does not promptly follow their employment, and, above all, if it be found, after they have been diligently applied for some hours, that the renewed efforts at the taxis are as unavailing as the previous, an operation should be performed with the least possible delay. That such a measure, however, is often necessary I am altogether unwilling to believe. On the contrary, I am satisfied from personal experience that, with the aid of anæsthesia, proper attention to the patient's posture, and a thorough knowledge of the anatomy of hernia, almost every case may be promptly relieved by the taxis. For years past I have not been obliged to use the knife in a solitary instance, even where the strangulation had existed for three, four, and five days, and where I had been requested by the attendant to bring my instruments for the purpose of operating. In most of these cases I have astonished the patient by the facility and promptness of the reduction, the absence of future suffering or inconvenience, and the rapidity of his recovery. It has long been the custom with some surgeons to operate in every instance of hernia after the slightest trial with the taxis, and in some of the foreign hospitals the employment of the knife seems to have become the rule, and the taxis the exception, recourse being had to it within five or six hours after the commencement of the strangulation. Such a procedure as this is certainly not justifiable when carried to such an extent, any more than too great a procrastination with the taxis.

The plan which I pursue, when called to a case of strangulated hernia, is perfectly easy and simple. In the first place, the patient is put thoroughly under the influence of chloroform, not ether, because this is apt to cause vomiting; secondly, the abdominal muscles are completely relaxed; thirdly, the tumor is fairly grasped with the hand, and then gently and steadily compressed, not pushed, kneaded, or squeezed by fits and starts. By the adoption of this simple method, patiently continued, I am certain that almost every hernia, however severely strangulated, may be safely and expeditiously reduced.

No opportunity has been afforded me of giving a fair trial to the method of reducing strangulated hernia, suggested by Seutin, and which, he declares, he had practised so successfully for the last twenty years of his life that he had rarely had occasion to employ the knife. It consists in forcibly dilating the stricture by means of the tip of the index finger, carefully insinuated into the constricting orifice, and then used as a hook, its palmar surface presenting towards the protruding parts, while the skin of the tumor is pushed gently upwards so as not to embarrass the proceeding. The patient lies upon his back, with the pelvis raised much higher than the shoulders, and the operation is persevered in until the ring is sensibly dilated, either by simple stretching or actual laceration of the resisting tissues; an effect which is generally indicated by a characteristic crack, perceptible by the finger, if not also by the ear.

A patient has sometimes succeeded in effecting the reduction of his own hernia, after every effort with the taxis in the hands of his attendant had failed. Such an expedient is always proper if the person is intelligent, especially if he has been in the habit of relieving himself on previous occasions.

It is well known, too, that our success with the taxis is sometimes more prompt and efficient if the abdominal muscles are rendered somewhat tense than when they are completely relaxed, as advised in a previous paragraph. Indeed, some practitioners, acting upon this knowledge, adopt this procedure in all cases. Turning the patient upon the side opposite the affected one sometimes answers a good purpose, especially when there is much flatus, the distended bowels drawing the protruded parts backwards and upwards. Lastly, I have often seen good effects follow the inordinate elevation of the pelvis, caused by suspending the patient, as he lies in bed, partially by his feet, and doubling up his body, thus producing the greatest possible degree of relaxation of the abdominal muscles, and also a certain amount of traction of the alimentary tube above the seat of the constriction.

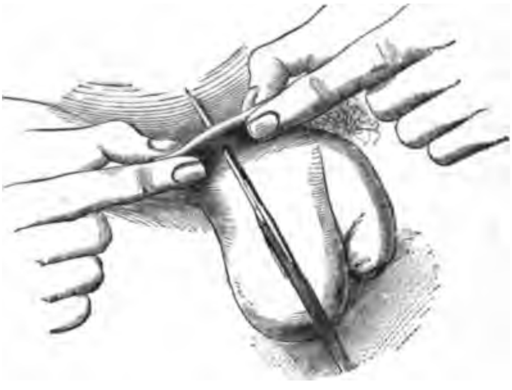
In his effort at the taxis, the surgeon, instead of restoring the protruded viscera to the abdomen, may push them upwards into a sort of artificial pouch in the cellular substance between the transverse fascia and the transverse muscle, thus leaving them unrelieved; or, it may be, that the stricture is within the sac, instead of on the outside, and that, although replacement may have been effected, the strangulation continues as violently as before. Such cases are well calculated to embarrass the practitioner, but they admit of no delay. The proper plan, in the first case, is, to request the patient to use every possible exertion, by coughing and other muscular efforts, to reproduce the hernia, and, if he succeed in this, to proceed at once to the use of the knife. This failing, the surgeon, guided by his previous knowledge of the situation of the tumor, and the direction of the replacement, cuts down upon the parts, dividing layer after layer until he comes in contact with the disaffected viscera, which are then disengaged, and restored to their natural position. A similar procedure is adopted when the stricture exists within the hernial sac, and the protruded structures have been returned without relief of the strangulation.

Finally, it is impossible for the surgeon to be too wary in the employment of these manipulations; they must, as already stated, be made gently, not roughly, nor must they be continued too long at a time, or be too frequently repeated. The want of proper precaution may be productive of great suffering and mischief, if not actual loss of life, from peritonitis and inflammation of the walls of the abdomen, followed, if the patient survive, by large abscesses and excessive constitutional irritation.

Supposing that the taxis has succeeded, the patient must not be permitted at once to rise, and go about his business, particularly if the strangulation has been at all severe. In such a case recumbency is enjoined along with light diet and a full anodyne, until all danger of inflammation is over, when, resuming the use of his truss, he may get up and walk about.

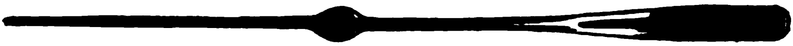
Operation.—When an operation becomes necessary, the patient is placed upon his back, very much as during the taxis. The bladder having been emptied, the hair shaved off the part, and an anæsthetic administered, an incision, linear, crucial, Y or V-like, or thus, ⊤, ⊥, ⟍, is made through the skin and superficial fascia, over the most prominent portion of the tumor, commencing at its upper extremity, and terminating near its base, its length varying from two to three inches, according to the size of the hernia. The integument may be divided subcutaneously, by pinching up a fold of skin, as shown in fig. 390, or by a direct incision, which, in fact, I usually prefer. However this may be, the rule is to make a large external wound, and a small internal one. Thus, layer after layer is divided until the surgeon reaches the proper hernial sac, free use being made of the grooved director, fig. 398, in exposing the deeper seated structures. The presence of the sac will usually declare itself by its bluish, vesicular appearance; but, to dispel all doubt, a portion of it should be pinched up between the thumb and forefinger, and the opposite surfaces rubbed against each other, which cannot be done if it be anything else; or, to render the diagnosis still more certain, a puncture may be made into the part with a small

Fig. 397.



Mode of operating in strangulated hernia.

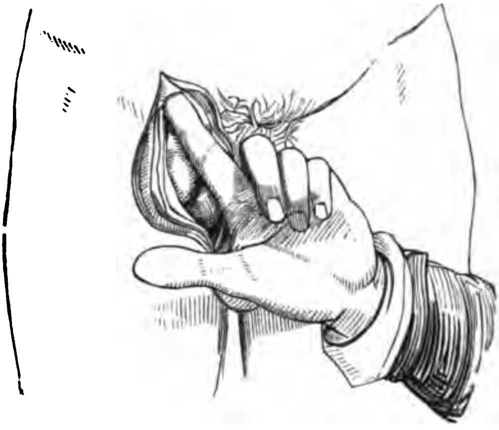
Fig. 398.



Grooved hernia director.

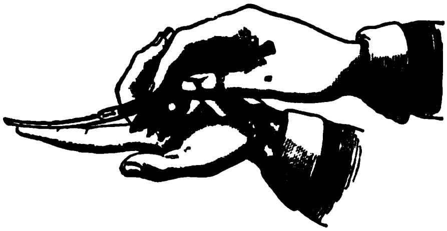
needle. If this be followed by a drop of serous fluid, it will at once decide the question. An opening, just large enough to admit the point of the director, is now made, when, the instrument being carried upwards and then downwards, the sac is divided to the requisite extent, followed, of course, by the escape of its contents. It should be recollected that the quantity of fluid is always small in recent strangulation, and that cases occur where it is entirely absent, lest, in our endeavors to find it, the dissection should be carried too far. The left forefinger, fig. 399, introduced into the bottom of the wound, now seeks for the seat of the obstruction at its upper extremity, and, having found it, a probe-pointed bistoury is carried flatwise along its palmar aspect underneath the stricture, which is immediately divided by bringing the edge of the instrument, as seen in fig. 400, to bear against it. A little incision, not more than a line and a half in length, will generally answer the purpose. The dislocated viscera are now drawn away from the seat of the obstruction, and being found in a condition to be restored, are next carefully replaced into the abdominal cavity, the part that protruded last being reduced first, and the bowel before the omentum. The edges of the wound being approximated by several points of the interrupted suture carried through the muscular layers, the dressing is completed by adhesive strips, a compress, and a bandage.

Fig. 399.



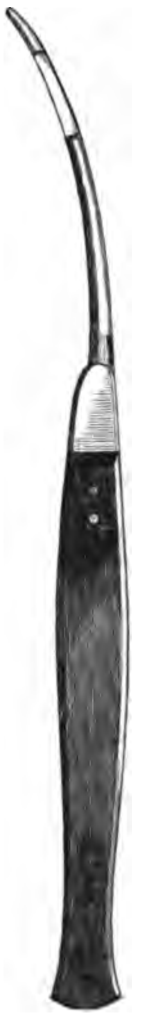
Searching for the seat of stricture.

Fig. 400.



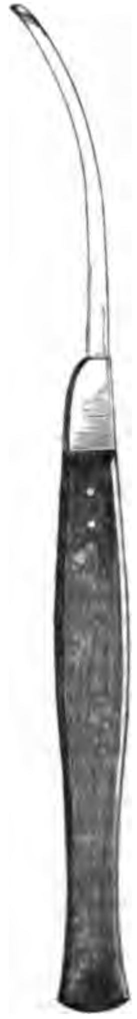
Mode of holding the knife in dividing the stricture.

Fig. 401



Hernia knife of Sir A. Cooper.

Fig. 402.



Probe-pointed bistoury.

The division of the stricture may be safely effected either with the hernia knife of Sir Astley Cooper, fig. 401, or with a common probe-pointed bistoury, represented in fig. 402.

It would almost be superfluous to say that the patient should be most carefuly watched after so serious an operation as that just now described. The treatment must be strictly antiphlogistic, and the probability of the occurrence of peritonitis must not be lost sight of for a moment. Much may be done in the way of prevention in most cases by the administration of a full opiate immediately after the patient has been put to bed, and by close attention to the diet and bowels, which should not be permitted to be moved for several days, but kept in the most tranquil condition possible. Should peritonitis arise, as indicated by the excessive tenderness of the abdomen, the retracted limbs, the shrunken features, and the small, wiry, and contracted pulse, the proper treatment will be venesection, leeching, anodyne fomentations, and large doses of opium. When the patient has recovered, he must wear a truss until the parts have become completely consolidated, otherwise relapse will be inevitable.

Examination and Treatment of the protruded Intestine.—In the operation as now performed, it is supposed that the protruded parts are in a fit condition to be restored to their natural situation; but cases arise where the surgeon may entertain doubts in regard to the propriety of this procedure, or where such a course would be altogether improper. Much judgment and experience are frequently required to enable him to decide the question correctly, and to act with the promptness and certainty which should characterize his efforts for his patient's relief. On the one hand, he may return parts actually in a state of gangrene, and thus inevitably kindle the flames of a fatal inflammation; or, on the other, he may, for want of proper knowledge, cut into the bowel and excise the omentum when they are in a condition to be safely replaced. Careful inspection is, in general, the only reliable source of information on such occasions, but valuable aid is occasionally furnished by extraneous circumstances, as the history of the case, the small size of the swelling, the duration of the strangulation, and the condition of the system. Thus, when the hernia is small and recent, the danger of mortification is always greater than when it is large, or large and old; it is also greater when the strangulation has been protracted than when it is recent, and the probability of its existence is almost converted into certainty when, after the ordinary phenomena of strangulation, there are a Hippocratic appearance of the countenance, a feeble, tremulous pulse, hiccough, and a crackling state of the tumor, with a sudden cessation of pain and excessive prostration of the vital powers.

The hernial sac having been exposed, and the stricture divided, the parts are gently drawn down, preparatory to a thorough examination of their condition. In all cases, whatever may have been the duration of the strangulation, there will be more or less injection of the vessels of the protruded structures, rendering the former unnaturally conspicuous, and heightening the color of the latter. The vascularity of the bowel is always, in the milder forms of the accident, arborescent, that is, the vessels are spread out over the surface of the tube in dendritic lines, and the accompanying discoloration is so slight as to be scarcely distinguishable from the normal appearance; but when the constriction has been severe or long-continued, the vessels assume a capilliform arrangement, and the peritoneal lining of the intestine exhibits a claret, purple, or blackish hue, with, perhaps, here and there a slight ecchymosis. The discoloration, in either case, may be diffused or circumscribed, uniform or diversified; generally the latter.

When the discoloration is slight in degree, although it may be extensively diffused, it may be assumed that the bowel is in a condition to be returned, especially if, after having been emptied of its blood, the vessels are speedily refilled. If, on the other hand, the bowel is very dark, purple, or almost black, the presumption will be strong that there has been great derangement of the circulation, if not actual stagnation of the blood, and replacement should not be attempted unless there is reason to believe that the part will be able to recover from the effects of its compression. To determine this question, one of the most serious that can arise during such an operation, the intestine, after having been thoroughly liberated, should be fomented with a sponge or cloth wrung out of warm water, and steadily maintained in contact with it for ten, twelve, or fifteen minutes; if it be found at the end of this time that there is no change in the appearance of the protruded knuckle, denotive of a return of its circulation, it will be proper to puncture some of its vessels, or even to scarify the bowel very slightly at a few points. If no blood issues, the probability is that the tube is mortified, a probability converted into positive certainty, if, superadded to this, there is a softened condition of the parts, an absence of all sensibility, and a total loss of temperature. Much stress has been laid by surgeons upon the greenish or ash-colored appearance presented by the bowel in strangulation, but my conviction is that its importance has been greatly magnified, and that, unless it is combined with other changes, especially changes of consistence, it should not be considered as an evidence of mortification.

When *mortification* has actually taken place, then, of course, the bowel is not returned, but freely opened to afford an outlet to its contents, the stricture having previously been relieved in the ordinary way. It has been objected to this procedure that it has a tendency to break up the adhesions which the intestine has formed to the edges of the hernial aperture, but such a conjecture is altogether hypothetical, and the practice founded upon it should, therefore, be disregarded. During the progress of the inflammation which precedes the mortification, the bowel is always firmly glued to the adjacent parts, and hence the incision necessary to liberate it never permits the extravasation of fecal matter into the peritoneal cavity. To leave the stricture undivided would be to afford only partial relief, not only as respects the symptoms of the strangulation, but also the evacuation of the tube, and might thus lead to the necessity of another operation, at a period, perhaps, when such a procedure might seriously disturb both the part and system. The wound is afterwards left open, and covered with warm water-dressing, fetor being allayed by the use of the chlorides.

No surgeon, nowadays, thinks of excising the mortified portion of bowel, and uniting the tube by the interrupted suture. Such a procedure would be attended with great risk, and has, therefore, very properly fallen into desuetude. Nor is it necessary, as it was once deemed to be, to secure the bowel to the external wound by a stitch through the mesentery, since, as has already been seen, the adhesion between it and the edges in the hernial aperture is always sufficiently firm to prevent its separation, and, consequently, the occurrence of fecal extravasation into the peritoneal cavity.

It has been proposed, when the mortification is very limited, to replace the bowel instead of opening it, as when the mischief is more extensive, on the supposition that, before the slough can separate, the parts immediately around the seat of the disease will have contracted firm adhesions to the neighboring viscera, thus protecting the peritoneal cavity against fecal effusion. The propriety of such a measure may well be doubted, and I should, therefore, discountenance its adoption, knowing as we do that a dead tissue, if brought in contact with a living one, must always act as a foreign substance, and that, although it might induce a deposition of lymph on the surface in its vicinity, yet the adhesions thus formed might not be strong enough to resist either the peristaltic movements of the bowel, the efforts of the abdominal muscles, or the pressure of the abdominal viscera.

Instances occur in which the bowel is *ulcerated*, from the compression exerted upon it by the stricture. Only one opening may exist, or the part may be pierced at a number of points, not larger, perhaps, than so many pin-heads, and separated by more or less healthy tissue. In the former case, the aperture, if not more than two lines or two lines and a half in diameter, may be included in a delicate ligature tied firmly round a tenaculum, the ends being afterwards cut off close to the knot, to enable it to discharge itself into the bowel, and pass off with its contents; otherwise the part must be treated as if it were mortified. A similar practice is adopted when the intestine has a riddled, cribriform appearance; because here it would not be possible to tie up each aperture, and yet not be safe to return the viscus without such a precaution.

Sometimes, again, the bowel is circularly indented by the stricture, as if it had been compressed by a tightly-drawn cord. In this way its circulation may be much embarrassed, if not completely suspended, followed by ulceration and even gangrene. The serous coat, possessing greater power of resistance than the others, usually retains its integrity longest, and the rule, therefore, is to return the viscus if its appearance is such as to justify the belief that it may become promptly adherent to the neighboring organs; otherwise to treat it as if it were sphacelated.

The bowel may have contracted *adhesions* to the inner surface of the sac, thus rendering its restoration difficult, if not impracticable. The mode of procedure varies according to the nature of the union, as to whether it is recent or old; in the former case, it may be easily broken up with the finger or handle of the scalpel, when the viscus, if otherwise in a proper condition, is at once replaced; in the latter, the liberation may be effected by a careful dissection, provided the adhesions are not very extensive, in which case the bowel, after having been freed by the division of the stricture, should be left in its extra-abdominal situation. When the adhesions are very firm, but limited, it has been suggested to dissect up the corresponding portion of the sac, and to return it along with the bowel; but in performing such an operation the greatest caution is necessary, otherwise the part may act irritatingly, and thus cause serious mischief.

Sometimes there is a firm and intimate adhesion between the bowel and the stricture extending round their entire circumference, and seriously interfering with the division of the latter. The practice under such circumstances has been to incise both bowel and stricture; but this need surely never be done if proper care and patience are exercised, for by a little management the surgeon will always be able either to find, or, at all events, to make, a little opening between the parts for the insertion of his director or probe-pointed bistoury. It is only when the adhesions are very old and firm that any real difficulty can arise, and even that may always be comparatively easily overcome by a little dissection.

The reduction of the bowel is sometimes materially impeded, if not effectually prevented, by an inordinate accumulation of *gas* in its interior. The difficulty will be likely to be augmented if the accident is associated with the presence of a large quantity of indurated feces, or the existence of an unusually narrow hernial canal. The proper remedy is puncture of the distended tube with a small bistoury, or, what is preferable, a very delicate trocar, the number of openings varying from one to four, six or eight, according to the exigencies of the case. The operation, if carefully executed, is perfectly free from danger, as is proved by the interesting examples observed by Krüger, Köllreuter, Graefe, Ludwig, Riecke, Löfler, Dinkelacker, and other German surgeons.

Indurated *fecal matter* may generally, with a little care and patience, be squeezed out of the incarcerated bowel, so as to admit of its gradual return to the abdomen. The operation should be performed with great gentleness, otherwise it might cause, if not rupture of the bowel, at all events an undue degree of inflammation. The stricture should, of course, be freely divided, as a preliminary step. If these means fail, a small incision should be made into the intestine, and the fecal matter pressed out, the wound, if more than a line and a half long, being afterwards closed with suture. If the intestine is distended with clotted blood, a similar course should be pursued.

A *twisted* condition of the bowel may interfere with its ready restoration, especially if it is at the same time firmly adherent to the sac. The obstacle may generally be easily overcome by gentle manipulation.

Finally, serious impediment is sometimes caused by œdema of the walls of the bowel, the consequence of inordinate effusion of serum, or of serum and lymph. The proper remedy is steady, systematic compression, aided by the free division of the stricture, and, if need be, by scarification of the peritoneal covering of the intestine.

Examination and Treatment of the Protruded Omentum.—Various circumstances may arise to render it improper to reduce a strangulated omentum, among which the principal are inflammation, mortification, hypertrophy, and morbid adhesions. It is well known that this body is much less capable of resisting the effects of inflammation than the intestine; hence it is, not unfrequently, in a condition not to be replaced when the other is, especially when it is loaded with fat, as it nearly always is in corpulent subjects, and when the slightest compression is almost sufficient to deprive it of vitality. The discoloration of an inflamed omentum is always less than that of an inflamed bowel, and its vessels, instead of exhibiting an arborescent arrangement so conspicuous in the latter, usually present themselves in straggling, perpendicular lines. Conjoined with these changes, there is always, particularly in the more violent and protracted forms of strangulation, well marked loss of consistence in the protruded part, so that the slightest pressure of the finger is sufficient to convert it into a pulpy mass.

The tests for ascertaining the vitality of a strangulated omentum are similar to those which have been described for judging of the vitality of a strangulated intestine; but it should be borne in mind, as was before stated, that a highly inflamed omentum is much more likely to die after it has been replaced than a correspondingly inflamed bowel; and hence, if its vessels are not speedily refilled after their contents have been pressed out, or the circulation does not afford evidence of returning vigor under the use of fomentations, no attempt should be made at restoration, lest the strangulated mass, acting as a foreign substance, should induce fatal peritonitis. Instead of this, the whole of the affected membrane is excised, and each artery is included in a separate ligature, one end of which is cut off close to the knot, and the other brought out at the wound, where it is secured by an adhesive strip. Before so important an operation is performed, the omentum should be carefully unrolled, for it has occasionally happened that it has contained a loop of intestine, which might thus be opened by the knife, much to the detriment of the patient and the dismay of the surgeon. To prevent it from being drawn up into the abdomen before its vessels are secured, it should be firmly held by an assistant, either with the fingers or by means of a temporary ligature.

Retrenchment will also be required when the omentum is much enlarged by interstitial deposits, rendering it impossible to replace it; or when, if restored, it would be likely, on account of its inordinate bulk and tuberculated surface, to cause violent peritonitis. Such a procedure is far preferable to that of leaving the protruded part in the hernial sac, in the hope of preventing thereby a recurrence of the rupture; a circumstance which, although possible, is not at all probable, and which, even if it did occur, would hardly compensate the patient for the severe dragging sensations to which he would ever after be exposed in consequence.

An adherent omentum is treated upon the same principles as an adherent bowel, only that greater liberty may be taken with it when the attachments are old, in which case it may not only be extensively dissected away from the sac, but, if necessary, cut off, in the same manner as in mortification and hypertrophy, already described.

A strangulated hernia sometimes becomes the seat of an *abscess*, the inflammation occasioned by the constriction terminating in suppuration. Such an event is most common in hernia of long standing, attended with the formation of a large sac, and the adhesion of the protruded structures to its inner surface. The immediate cause of the deposition of matter may be the constriction itself, the compression of the sac by the imprisoned viscera, or, finally, some external injury, as a blow, or twist, or rough manipulation, inflicted during an attempt at reduction. The matter, which occasionally forms very rapidly, is of a sero-purulent character, and is sometimes quite profuse, amounting to many ounces. If the patient survives for eight or ten days, the fluid gravitates towards the most dependent portion of the tumor, where it may readily be detected by the distinct sense of fluctuation which it imparts to the fingers, by the exquisite pain and tenderness it produces on pressure, and by the red, œdematous condition of the integuments. In some cases, the matter breaks through its confinement, and finds its way by ulceration to the nearest surface. I have known an abscess to form when the protruded part consisted exclusively of bowel, but the occurrence is by far most common when the hernia is omental, or omental and intestinal.

The termination of such an abscess is variable. The matter may be evacuated, and the patient make a good recovery, the parts being relieved immediately after the fluid has been drawn off, or the pus may escape into the peritoneal cavity, and cause fatal inflammation; or an opening may form externally, admitting of the discharge both of matter and of feces, as when the bowel has been invaded by gangrene; or, finally, the abscess may be emptied by puncture, but, the constriction remaining unrelieved, the patient may perish under symptoms of strangulation.

In any event, a hernial abscess may be considered as a serious complication, both as it respects the fate of the patient and the nature of the diagnosis, which is often extremely difficult and perplexing. The proper treatment, of course, is to lay the sac freely open, to evacuate the purulent fluid, to relieve strangulation, and to restore the protruded structures to their natural position.

In operating upon old strangulated ruptures, the surgeon occasionally encounters an adventitious cyst, or a cyst formed by the obliteration of a part of the proper sac. Its contents are either serous or bloody, and its size rarely exceeds that of a small walnut. It is generally situated at the bottom of the protruded structures, but sometimes in front, at the side, or even behind. I once met with an old strangulated scrotal hernia, which contained three distinct sacs, the lower being occupied by water, the middle by omentum, and the upper by intestine. The coexistence of so much disease is well calculated to cause serious embarrassment to an inexperienced operator.

Division of the Stricture external to the Sac.—This procedure, devised upwards of a century ago, by J. L. Petit, has many advocates, especially in England, where it has received much attention within the last twenty years, chiefly through the influence and writings of some of the London surgeons. In this country it has probably not attracted as much notice as it deserves. The great advantage of it is that, as it does not interfere with the proper hernial sac, it is much less liable to be followed by peritonitis, which constitutes the great source of danger in the ordinary operation. Added to this, it is generally more easy of execution, and attended likewise with less risk of injury to the intestine. On the other hand, the stricture may exist within the sac itself, and the parts might therefore be returned without being relieved; a result, the effects of which would only be too certainly fatal. The cases to which the method is more particularly applicable are, first, where there is reason to believe, from the character and duration of the symptoms, that the strangulation cannot be dependent upon the presence of plastic adhesions, but that it is caused by the edges of the hernial aperture; and, secondly, where the tumor is old and has long been irreducible, and where, consequently, if the stricture is internal, relief may be afforded by a subsequent operation.

Notwithstanding the most thorough division of the stricture in this operation, it is often impossible to restore the contents of the hernia without opening the sac. A similar proceeding is sometimes necessary when, after their reduction, doubt arises respecting their perfect liberation. The incision need generally not exceed the third of an inch. Experience has shown that the operation is most frequently required in inguinal hernia.

The relative safety of the ordinary operation and the operation of Petit, or the division and non-division of the sac, has been placed in a very strong light by the statistics of Mr. Gay. Thus, out of 125 cases, treated according to the former method, 52 perished, whereas out of 73 cases in which the sac was not opened, only 13 succumbed. Mr. James Luke, in 1848, reported 59 cases, in which he had performed this operation, of which 52 recovered, and 7 died. The results of his cases show that the operation is by far more frequently successful in femoral than in inguinal hernia.

Subcutaneous Division of the Stricture.—Relief of the strangulation by subcutaneous section is occasionally attempted. The operation was first proposed about twenty-five years ago, by Mons. Bouchut of France. In this country almost the only surgeon who has performed it is Professor Pancoast, but with what success I am not able to state. The process is mainly, if not exclusively, applicable to old, bulky, inguinal hernias, in which the stricture is seated at the external ring.

The operation is performed by introducing a director underneath the skin, between the sac of the hernia and the resisting structures, which are then cautiously divided by means of a delicate probe-pointed bistoury, carried along the groove of the instrument. Bouchut suggests the employment of a sheathed bistoury, slightly bulbous at the extremity. Whatever the character of the knife may be, the greatest possible care must be taken not to wound the protruded organs.

When we consider the difficulties which so often beset the ordinary operation for the relief of strangulated hernia, it is not at all probable that the subcutaneous method will ever meet with much favor from the profession. It is, in fact, a blind procedure, which few men are qualified to execute successfully.

Accidents.—The principal accidents that are liable to happen during this operation are wounding of the intestine and hemorrhage. Formerly these accidents were not infrequent, but they certainly are at the present day, owing, no doubt, to our improved knowledge of the anatomy of the different varieties of hernia, and of the relative position of the bloodvessels. Wounding of the intestine is generally the result of sheer carelessness, but hemorrhage may occur in the hands of the most skilful operator, and may, therefore, be considered as, in some degree, unavoidable, whatever may be the precautions exercised in making our incisions and in dividing the stricture.

A *wound* of the bowel will be denoted by the escape of gas, feces, mucus, or ingesta, and, unless extensive, will not add materially to the danger of the operation. If it is very small, as, for instance, not more than a line and a half in length, it may be hooked up with the tenaculum, and included in a fine ligature, the ends of which are cut off close to the knot. If the incision is more extensive, the interrupted, Lembert's, or the glover's suture, must be used, as in an ordinary wound of the bowel. The tube is then replaced, and the case treated upon general antiphlogistic principles.

The *hemorrhage* may proceed from injury of the epigastric, obturator, or spermatic artery, and is sometimes alarmingly profuse. In operating for strangulated femoral hernia, the femoral or saphenous vein has occasionally been wounded, but such an occurrence implies great carelessness, and never happens to a skilful surgeon. When the bleeding is external, the vessel from which it proceeds may occasionally be exposed simply by everting the edges of the wound, or drawing down the neck of the hernial sac; this failing, it is sought for with the knife. The same plan is pursued when the hemorrhage is internal, the wound being enlarged, more or less freely, with the probe-pointed bistoury. Sometimes the flow of blood is readily arrested by systematic compression, made with the compress and bandage, or by means of the finger of a relay of assistants.

Lastly, the *protruded parts*, instead of being restored to the abdominal cavity, may be engaged in the cellular tissue between the transverse fascia and transverse muscle, where, the strangulation continuing, they may cause fatal mischief. To prevent this occurrence, the finger should always, if possible, be carried into the belly, and gently moved about, to ascertain that the viscera are in their proper situation. Should this be found not to be the case, every effort should be made to liberate them; with the finger, if practicable, with the knife, if not. To leave them in their new position, would be almost certain death.

This accident is most liable to occur when an attempt is made to restore a strangulated hernia by pushing the sac and its contents forcibly through the opening in the wall of the abdomen. This plan, described by the French surgeons as "reduction en bloc, or en masse," is, in the main, a bad one, inasmuch as the surgeon is often compelled to use undue violence, in which the protruded structures may be more or less bruised and the sac even lacerated. Mr. Birkett has shown by an analysis of a number of cases that the accident is most frequent in that variety of inguino-scrotal hernia in which the parts have descended into the vaginal process of the peritoneum, owing to the great length of the sac.

Mortality.—The mortality after herniotomy must necessarily vary with many circumstances, as the mode of operating, the duration of the strangulation, the presence or absence of other maladies, the age of the patient, the nature of the rupture, and the effects of previous treatment.

1st. It has already been seen that the *operation* of Petit is, as a general rule, attended with much less hazard to life than that in which there is a division of the hernial sac. Of 774 cases treated according to the latter method, and collected by Mr. Gay from various sources, private as well as public, 334 died. Such a mortality is truly appalling; but, while it probably affords a fair average proportion in a given number of cases, it cannot be regarded as a just representation of the results of individual experience. Herniotomy shares, in this respect, the same fate as lithotomy, amputations, resections, ovariotomy, trephining, and other capital operations, some surgeons being much more fortunate than others, either because they possess greater skill, or because they are more careful in the selection of their cases.

2dly. The *duration of the strangulation* must necessarily greatly influence the issue, recovery being more likely to take place when the operation is performed early than late, when the patient is, perhaps, already nearly dead from shock, or shock and inflammation. All surgeons concur in the conviction that delay beyond the second day is extremely hazardous. The annexed table of Mr. Gay, slightly modified, places this subject in a very clear light.

DAY.	CASES.	RECOVERIES.	DEATHS.
1st	49	43	6
2d	41	30	11
3d	9	3	6
4th	5	2	3
5th	4	0	4
6th	7	3	4
10th	3	0	3
	118	81	37

3dly. *Recovery* after operation is often materially affected by the previous state of the *patient's health.* The existence of organic lesion of the heart, large vessels, lungs, pleura, and kidneys, especially if attended with anemia, is particularly unfavorable to success, such a condition predisposing to rapid exhaustion, and to the development of a bad form of peritonitis.

4thly. *Young persons* are less liable, other things being equal, to die from the effects of the operation than the old and decrepit, who are very apt to sink under its effects, especially when there has been unusual delay.

5thly. The mortality of strangulated *femoral and umbilical* ruptures is, on an average, considerably greater after operation than that of inguinal hernia, but in what ratio has not been determined.

Finally, it must not be forgotten that the results of herniotomy are often materially influenced by the effects of the *previous treatment.* Rude and protracted manipulation cannot fail to be prejudicial, from its tendency to provoke peritonitis, and there is no doubt that many a patient has been killed by tobacco injections, the hot bath, and excessive venesection, although the operation itself may have been well performed.

Causes of Death.—The principal causes of death after herniotomy are shock, hemorrhage, peritonitis, erysipelas, and pyemia.

1st. Fatal *shock* after this operation is uncommon. It is most frequently witnessed in old, dilapidated subjects, exhausted by the long continuance or severity of the strangulation, and occasionally occurs where there is not the slightest evidence of constriction of the bowel, pressure upon the omentum alone being capable of producing it.

2dly. Loss of life from *hemorrhage* after herniotomy is infrequent; for the surgeon, as already stated, seldom divides any important artery in his attempts to uncover and liberate the protruded parts; and, when the accident occurs, he is generally able to secure the vessel before the patient has sustained any serious detriment.

3dly. The most common cause of the fatality after this operation is undoubtedly *peritonitis.* This disease, in fact, generally exists, to a greater or less extent, in all cases of strangulated hernia prior to the operation, and it is, therefore, not surprising that it should often be materially aggravated by the use of the knife and finger, especially when the sac is laid open, by the contact of inflamed with healthy peritoneum after the reduction of the parts, or by the escape of fecal matter, as sometimes happens in ulceration of the bowel. When death arises from peritonitis, however induced, it usually takes place within the first three or four days after the operation.

4thly. A bad form of *erysipelas* not unfrequently comes on after this operation, generally during the first thirty-six hours, being most common in persons of broken constitution and intemperate habits, and in such as are laboring under organic disease of the heart and kidneys. The attack manifests itself by a reddish or livid appearance of the parts, soon followed by gangrene and sloughing, or, at all events, by a foul, unhealthy condition of the wound, and by great irritability and depression of the system. The period at which it proves fatal varies, on an average, from three to five days.

5thly. *Pyemia,* as a cause of death after herniotomy, is of rare occurrence. It is most liable to arise in persons who have suffered severely from the shock of strangulation, or from shock and hemorrhage, and usually comes on within the first three days after the operation.

Finally, death is occasionally produced by the rude employment of the *taxis,* in consequence of the imperfect division of the stricture, or the adhesions of the protruded parts to each other and to the hernial sac. An accidental wound or rupture of the intestine may be cited as another cause of fatality.

Old Hernial Sacs.—An old hernial sac, long freed of its contents, may, by becoming inflamed, cause symptoms closely simulating those of an ordinary strangulated hernia, especially when it retains its communication with the general peritoneal cavity. The suffering will be less marked when this connection has been destroyed, the pouch forming a shut sac filled with serum, pus, or blood.

This variety of hernia, sometimes called *pseudo-hernia,* is more liable to strangulation in women than in men, and in the femoral than in the inguinal region. The tumor is generally small, not exceeding the volume of a pullet's egg, of a rounded or ovoidal figure, and of a tense, slightly elastic consistence. When of considerable bulk, and not too firmly bound down, it may impart a distinct sense of fluctuation. In cases of doubt, the parts should be punctured with a fine needle. An escape of serum, pus, or blood will generally at once determine the diagnosis. When the uncertainty continues, with the symptoms of strangulation unabated, the rule is to operate, as no harm can result from exposing the tumor, whatever may be its character. It is a singular fact that most of the patients in whom this pseudo-hernia has been observed wore trusses at the time of the occurrence of the strangulation, and were, apparently, unconscious of the nature of their complaint.

When a hernial sac of this kind becomes inflamed, relief should be attempted by antiphlogistic means, especially leeches and refrigerant applications; these failing, the parts should be carefully exposed, and all sources of constriction removed. When the tumor consists of a shut sac, filled with serum, the proper plan will be to lay it freely open, and to mop its surface thoroughly with dilute tincture of iodine, in the hope of thus effecting its obliteration. Excision of such a sac, although not necessarily fatal, would be hazardous, inasmuch as it might provoke severe, if not destructive, inflammation. Moreover, in the event of recovery, the operation might be followed by a redescent of the viscera, by breaking up important adhesions.

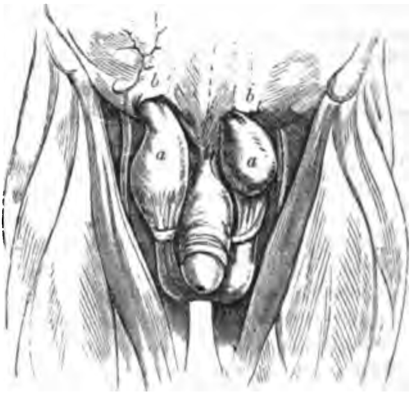
SECT. II.—HERNIA OF PARTICULAR REGIONS.

The principal varieties of hernia are the inguinal, scrotal, femoral, and umbilical, to which may be added the rarer forms of obturator, sciatic, perineal, pudendal, vaginal, and diaphragmatic.

INGUINAL HERNIA.

When the contents of the abdomen pass out at the groin, the complaint constitutes what is called an inguinal hernia, or a rupture of the groin. Of this affection there are two distinct varieties, fig. 403, namely, inguinal hernia by the oblique descent, and inguinal hernia by the direct descent, each of which demands separate consideration.

Fig. 403.



Inguinal hernia; on the right side oblique, on the left direct. *a.* The hernial sac. *b.* The epigastric artery.

Oblique Inguinal Hernia.—Oblique inguinal hernia derives its name from the fact that it pursues the course of the spermatic cord in the male, and of the round ligament in the female. It is of more frequent occurrence than all the other varieties of the complaint put together; is met with chiefly in men, and is more common on the right side than on the left. The reason why this form of hernia is so much more frequent in men than in women, is the greater relative size of the inguinal rings and canal in the former than in the latter, thus constituting a powerful predisposition to the disorder. Another reason, doubtless, is that men are much more exposed to all kinds of hardships, involving inordinate muscular exertion. The situation of the liver has usually been assigned as the cause of the greater frequency of hernia on the right side than on the left, the pressure which it exerts upon the alimentary tube, and through it upon the inguinal region, being much greater than that exerted by the spleen. As another cause of the difference, though probably not a very efficient one, may be mentioned the circumstance that most persons are right-handed, thereby keeping the right abdominal walls more constantly in a state of tension, especially in the working classes, among whom inguinal hernia is so common. The affection is produced by the same causes as ruptures in other situations, and may be complete or incomplete, according as the parts protrude or not at the external ring.

Age exerts a marked influence upon the production of this variety of inguinal hernia. Of 300 cases, analyzed by Malgaigne, 22 occurred before the end of the first year, 7 from the first to the fifth year, 15 from the fifth to the tenth, 26 from the tenth to the twentieth, 45 from the twentieth to the thirtieth, 66 from the thirtieth to the fortieth, 42 from the fortieth to the fiftieth, 36 from the fiftieth to the sixtieth, 30 from the sixtieth to the seventieth, and 11 from the seventieth to the eighty-ninth.

In complete oblique inguinal hernia the viscera enter the internal inguinal ring, and, descending along the inguinal canal, emerge at the external ring, forming thus a tumor in the groin, immediately above Poupart's ligament, and just outside of the spine of the pubes. Varying in volume from that of a pigeon's egg to that of the fist, it is usually of a globular form, and of a soft consistence, receiving a distinct impulse on coughing, and receding during recumbency, but reappearing in the erect posture.

There is a peculiar form of inguinal hernia, accompanied by an undescended testicle, in which the tumor extends uncommonly far outwards and upwards towards the crest of the ilium. In a case recently under my charge, in a man, aged thirty-five, at the Philadelphia Hospital, the tumor was of extraordinary volume, measuring twenty-two inches in circumference at its attachment to the abdomen, by nine in length, and ten in width. It was of a globular form, and hung down over Poupart's ligament, on the right side, as far nearly as the upper third of the thigh, reaching, on the one hand, over to the pubic symphysis, and, on the other, to the anterior superior spinous process of the ilium. It was soft, elastic, and easily reducible, the parts returning with a gurgling noise. The opening through which the bowel had descended appeared to be upwards of an inch in diameter, and to correspond with the internal ring. The testicle lay at the outside of the tumor, between the inner ring and the anterior superior spinous process of the ilium, and was remarkably sensitive to the touch, but of the usual size. The left testicle was also retained in the groin, occupying the site of the internal ring. The scrotum existed in a rudimentary state. The hernia had come on five years previously, in consequence of a strain, and had of late greatly increased in bulk. The tumor exhibited altogether a very remarkable appearance. There is no doubt that the protruded viscera in this case would have passed into the scrotum, if their progress had not been impeded by the undescended testis, which had the effect of pushing them upwards and outwards.

An instance of oblique congenital inguinal hernia in a man, aged twenty-seven years, was recently described by Mr. W. J. Wilson, in which an oval mass of omentum, inclosed in a sac with a contracted neck, occupied the natural position of the testicle, which was retained in the inguinal canal.

Diagnosis.—The diagnosis of this variety of hernia may be obscured by various affections liable to occur in this situation, among which the most common are hydrocele of the spermatic cord, imperfect descent of the testicle, diseased lymphatic ganglions, and psoas abscess. An oblique inguinal hernia, so long as it remains in a reducible state, may, in general, be easily distinguished from other affections; but the case is very different when it becomes irreducible or strangulated. Then the most experienced surgeon cannot always determine, without the greatest care, the precise nature of the complaint.

An encysted *hydrocele* of the spermatic cord is generally small, not exceeding the volume of a pigeon's egg, round or ovoidal, tense and elastic, uniform in its consistence, fixed in its situation, and distinctly translucent when viewed against the light. These characters, together with its history, are sufficient to distinguish it from hernia, provided it is below the external ring, but when it is above this point, under cover of the tendon of the external abdominal muscle, some difficulty may be experienced. When this is the case, a small exploring needle will generally furnish the requisite information.

An imperfectly descended *testis* might be mistaken for an oblique inguinal hernia, especially if it were to lie, as it sometimes does, partly within and partly outside the external ring. Its ovoidal form, however, its constant, unvarying volume, its firm consistence, and the peculiar sickening sensation produced by compressing it, together with the history of the case, and the absence of all disturbance of the intestinal tube, will hardly admit of the possibility of confounding the two complaints with each other.

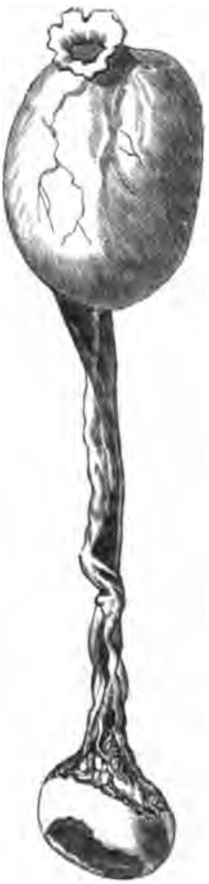
An inguinal hernia is sometimes closely simulated by an inflamed *lymphatic ganglion*, and the diagnosis may be still further embarrassed by the coexistence of the two diseases. Enlargement of the absorbent glands of the groin may result from various causes, of which, however, the most common are gonorrhœa and chancre, leading often to a great deal of tenderness, pain, and swelling, followed, in time, by suppuration and abscess. In the early stage, the affection might be mistaken, especially by an incautious observer, for an inguinal rupture. In general, the enlargement is easily recognized by its situation, which is oftener below than above Poupart's ligament, by its defined, circumscribed character, by its mobility, and by our being able, when the tumor is grasped, to lift it away, as it were, from the subjacent parts; circumstances which, joined to the history of the case, will usually serve to show that the tumor is not a hernia.

Another source of doubt in this affection is *psoas abscess*, which, as it progresses, often points just above Poupart's ligament, generally, however, nearer to the anterior superior spinous process of the ilium than to the pubic symphysis, which is not the case in complete inguinal hernia, whether by the oblique or direct descent. In psoas abscess, moreover, the patient is always somewhat lame on the corresponding side, and there is more or less derangement of the general health prior to the occurrence of the doubt in the diagnosis. Besides, in strangulation the tumor is fixed, whereas in psoas abscess it is movable, receding under pressure, and disappearing measurably or completely during recumbency.

In the female the diagnosis of inguinal hernia is occasionally obscured by the existence of a *serous cyst*, formed apparently in connection with the canal of Nuck, a process of peritoneum, extended over the round ligament. The tumor, which is sometimes prolonged into the labium, is free from pain, slow in development, semi-pellucid, globular, ovoidal or pyriform, elastic, fluctuating, and filled with a thin, watery fluid, similar to that of hydrocele. Its volume ranges between that of an egg and a large fist. In a case mentioned by Scarpa, the cyst, attached by a narrow pedicle, was fourteen inches in circumference, and contained forty-three ounces of fluid.

In oblique inguinal hernia the *spermatic cord* is situated behind the tumor, as exhibited in fig. 404, the epigastric artery lying on its inner side, close to its neck. As it proceeds downwards to its place of destination in the groin, it clothes itself, in addition to its proper sac, with the infundibuliform process of the transverse fascia, the fibres of the cremaster muscle, the spermatic fascia, superficial fascia, and skin. Hence, every such hernia may be said to have six coverings, which, in cases of long standing, are generally quite thick and closely matted together, but often very thin and indistinct in those of recent formation. I recollect operating, some years ago, upon a strangulated inguinal hernia, where the coverings of the tumor consisted only of the skin and the merest film of cellular tissue. In old ruptures, on the contrary, especially in those of large bulk, a tedious dissection is often necessary before we can reach the proper sac, skin, fascia, muscular and aponeurotic fibres being all in a state of thickening, induration, and condensation from interstitial deposits.

Fig. 404.



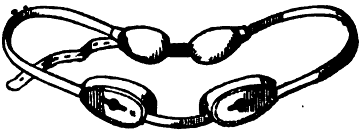
Hernial sac, showing its usual situation in front of the spermatic cord.

In recent oblique inguinal hernia, the *internal ring* occupies its accustomed situation, that is, it is midway between the anterior superior spine of the ilium and the pubic symphysis, about four lines above Poupart's ligament, and this, therefore, is the point where the pad of the truss is to rest in the reducible form of the affection; but in cases of long standing and of great bulk, the opening undergoes important changes in its relative position, being dragged down just behind the external ring, the intervening canal itself being effaced. The ring, moreover, under these circumstances, is generally very much enlarged, and of an annular form, so as to admit very readily the extremity of a big finger. A knowledge of these changes is of the greatest importance both in relation to the taxis and the operation for strangulated hernia.

The *contents* of this variety of hernia usually consist of a knuckle of the ileum, either alone, or in union with a portion of omentum; sometimes of the arch of the colon, and occasionally of the cæcum, the sigmoid flexure of the colon, and of the urinary bladder. The disorder may coexist with inguinal hernia by the direct descent, femoral hernia, or umbilical hernia. In one case an inguinal and a femoral hernia were found on each side of the same person.

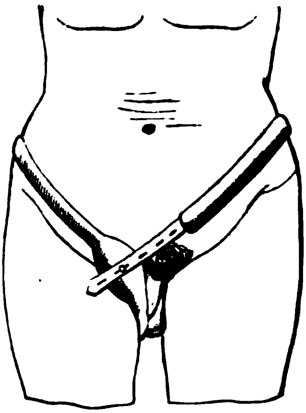
Treatment.—For the reducible oblique inguinal hernia a well constructed truss is used, the pad being of an ovoidal shape, arranged obliquely in reference to its spring, and applied in such a manner as to compress the internal ring. The precise point upon which, in recent cases, the pad should rest is about four lines above Poupart's ligament, equidistant between the pubic symphysis and the anterior superior spinous process of the ilium. In cases, however, of long standing, where the two openings are on the same plane, the pressure must obviously be made lower down, as well as farther in towards the median line, or, to speak more definitely, directly in the situation of the outer ring. The block, too, should be somewhat larger, in order that its influence may be more widely diffused. In the double form of hernia a double truss will be required, and one of the best for this purpose is that delineated in fig. 405, with two pads in front and two behind, to equalize the pressure both upon the part and trunk.

Fig. 405.



Double truss.

Fig. 406.



Betzel's truss applied.

The best retentive truss for ordinary inguinal hernia, whether by the oblique or direct descent, that I am acquainted with, is one devised by Dr. Betzel, of this city. The pad is of an elongated, ovoidal form, and is so arranged as to adapt itself most thoroughly to the groin and thigh, to which it is still further secured by means of a soft buckskin strap. The spring extends as far as the spine where it is connected with a band carried round above the opposite hip, and fastened to the pad in front. The apparatus, fig. 406, is particularly suitable for cavalrymen, mechanics, and laborers, who are obliged to perform varied and sudden movements and contortions of the body, as it does not relinquish its grasp upon the parts.

The irreducible oblique inguinal hernia is treated upon the general principles laid down in the previous section, care being taken to give due support to the parts by means of a suspensory bag, or a hollow truss, worn day and night. In this way the hernia is prevented from increasing, at the same time that it is measurably protected from harm.

In the event of strangulation occurring in this variety of hernia, the *taxis* is to be employed in strict conformity with the direction of the descent. Thus, in recent cases, where the rings retain their natural position, the parts are pushed obliquely upwards and outwards, in the course of the inguinal canal; whereas, under opposite circumstances, the pressure is made directly upwards, or upwards with a slight inclination outwards. Unless the strictest attention is given to these rules, the surgeon may find it extremely difficult, if not impossible, to attain his object. In regard to the position of the patient, it should be in strict accordance with the instructions laid down under the general observations upon this subject.

Should the taxis fail and an operation become necessary, the *stricture* will generally be found to be at one of three situations; at the internal ring, within the canal at the edge of the transverse and internal oblique muscles, or at the external ring. In old and large hernias, the obstruction is usually at the latter point, whereas, in the small and recent, it is commonly at one or the other of the former. However this may be, the finger will always readily detect it as soon as the proper sac has been sufficiently exposed to receive it. In dividing the stricture where no doubt exists as to the precise nature of the descent, the direction in which the knife should be carried is obvious enough, being in the one case obliquely upwards and outwards, and in the other directly upwards; but when it is uncertain whether the hernia was originally one by the oblique or straight descent, the safest rule, as it respects the epigastric artery, is to cut directly upwards, inclining the knife neither to one side nor to the other. For, should the hernia be one by the direct descent, and the surgeon carry his instrument upwards and outwards under the idea that the hernia is oblique, he would almost inevitably injure the vessel in question, and thus lead to a very embarrassing, if not a fatal, hemorrhage. The rule here described, then, should be most scrupulously observed in all cases of doubt.

The direction of the external incision must vary according to the nature of the descent, and may be simply a linear one, as when the tumor is very small, or T-like, curvilinear, or crucial, if it is large. The dressings and after-treatment are in every respect the same as under ordinary circumstances.

Incomplete Oblique Inguinal Hernia.—The incomplete inguinal hernia has received different names, expressive either of its situation or of its obscure character, as interstitial, interparietal, and concealed. The term incomplete is, perhaps, as proper as any other, and may, therefore, be employed to their exclusion, the more especially as we shall thus remove one source of confusion.

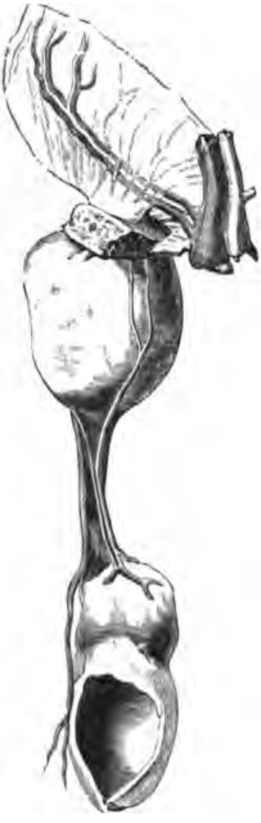
In this variety of hernia, which is merely a subdivision of that just described, the abdominal viscera pursue the same course, only that they do not pass out at the external ring; indeed, very frequently they do not even descend nearly so low down. I have seen several instances where the hernia consisted of less than one-sixth of the diameter of the bowel, which projected scarcely a third of an inch into the inguinal canal, and which, consequently, did not form the slightest appreciable tumor in the groin. Such an occurrence is always peculiarly dangerous, from its great liability to be overlooked when it becomes strangulated. In the cases adverted to all the patients perished from this cause. Dissection revealed the existence of severe peritonitis and a stricture just within the inguinal canal. In two of the cases the stricture had been formed by the edges of the internal ring.

A case recently occurred at the Pennsylvania Hospital, under the care of Dr. Hewson, in which the protruded part consisted of the vermiform appendix, the extremity of which had been opened by gangrene, so as to admit of the passage of a probe into the cæcum.

In general, however, the protrusion is more voluminous, and often consists both of bowel and omentum, passing down some distance into the canal, and forming a well-marked prominence externally; liable to be mistaken for encysted hydrocele of the spermatic cord, psoas abscess, or an imperfectly descended testicle, and, when strangulated, tender under pressure, painful, resisting the taxis, and attended with great constitutional distress. The mode of determining the diagnosis is similar to that of ordinary oblique inguinal hernia, but additional solicitude should be felt when, if strongly-marked symptoms of strangulation exist, there is no tumor in the inguinal region, or in any of the usual sites of rupture. In such a case the most thorough scrutiny should be instituted, and it would be well, when there is no outward evidence of the affection, to put the patient in the proper position for the taxis, and to use the same means for effecting reduction as if we were positively assured of the presence of hernia. I should, in such an event, place no little reliance upon any tenderness that might be discovered at or near the internal ring, as a guide to the course to be pursued for the relief of the patient. Even if it were only slight, but circumscribed, a judicious surgeon would hardly hesitate, especially when everything else is clearly denotive of the existence of strangulation, to use the knife, well knowing that no great harm could result from it, even if the operation proved to be a failure; whereas, if a hernia really existed, it would be the only proper procedure after a fair trial of the taxis.

The coverings of this variety of hernia are, examining the parts from without inwards, the skin, superficial fascia, tendon of the external oblique muscle, cremaster muscle, and infundibuliform process of the transverse fascia, together with the proper sac. The stricture is usually formed by the edge of the internal oblique and transverse muscles, and should be divided by carrying the knife obliquely upwards and outwards, as we shall thus effectually avoid the epigastric artery, which always lies on the inner side of the tumor. When the included portion of bowel is very small, the seat of the constriction will generally be at the internal ring or at the mouth of the sac. The spermatic cord always bears the same relation to the protruded parts as in complete oblique inguinal hernia.

Fig. 407.



Direct inguinal hernia; showing the mouth of the sac lying on the pubic side of the deep epigastric vessels.

Direct Inguinal Hernia.—Inguinal hernia by the direct descent, or ventro-inguinal hernia, as it is sometimes denominated, is comparatively infrequent, especially in the female, in whom it is so rare that many surgeons even in large practice never see an instance of it. Possibly it may be more common than is supposed, but being difficult of diagnosis, it may not always, or, perhaps, even ordinarily, be in our power to distinguish it from the oblique form of the complaint. The reason why women are so seldom affected with ventro-inguinal rupture, is, the small size of the rings and canal, as compared with those of the male, and the greater amount of resistance which these parts are consequently capable of affording to the protrusion of the abdominal viscera.

In this variety of rupture, the viscera descend immediately behind the external inguinal ring, passing either below the transverse and internal oblique muscles, or through an opening, usually somewhat slit-like, in their fibres. The epigastric artery, seen in fig. 407, and the spermatic cord lie on the outside of the sac, though occasionally the latter is placed in front or even on the inside of the tumor, but this is the exception, not the rule. Its coverings consist of the skin and superficial fascia, the spermatic fascia, some of the fibres of the cremaster muscle, a prolongation of the transverse fascia, and, lastly, of the proper sac. Sometimes a few straggling fibres of the transverse and internal oblique muscles are sent down over the tumor, and thus serve to give it a partial investment. The tumor is of the same form and consistence as in oblique inguinal hernia, but seldom so large, and is distinguishable from other affections of the groin in the same manner. It is usually composed of bowel alone, the omentum entering less frequently into its formation than in the more common variety of inguinal rupture.

In employing the truss for the relief of this form of hernia, care must be taken to apply the pad directly above the external ring, a point which, it will be perceived, is considerably further down and inwards than in a recent oblique hernia. When strangulation occurs, the parts are pushed directly upwards and backwards, or, if the tumor is small, directly backwards, the same precautions being observed in regard to the position of the body and limbs of the patient as in the other varieties of inguinal hernia. Should an operation become necessary, the stricture will be found either at the external ring, or at the inferior edge of the transverse and internal oblique muscles, and is to be relieved by carrying the knife directly upwards, to avoid injury to the epigastric artery which lies on the outside of the tumor. This precaution is so much the more necessary, inasmuch as it is not always in our power to determine whether the rupture is one by the direct or oblique descent. Thus, if the surgeon, in dividing the stricture, were to incline the knife inwards under the supposition that he had to deal with a direct hernia, but which proved to be an oblique one, the result would almost inevitably be a wound of the vessel under consideration; hence, in order to avoid such a contingency, the best plan, in all cases, is to carry the instrument directly upwards, without any lateral deviation whatever.

Inguinal Hernia in the Female.—When the viscera project from the inguinal canal into the labium, so as to constitute what is termed inguino-labial hernia, an exceedingly uncommon form of rupture, the descent is generally oblique, the parts following the course of the round ligament of the uterus. Hence the epigastric artery will usually be found to be on the inner side of the tumor, as in oblique inguinal hernia of the male.

The coverings of this variety of hernia consist of the skin, superficial fascia, intercolumnar aponeurosis, transverse fascia, and peritoneum, the latter forming the proper sac. The cremaster muscle is, of course, wanting. The round ligament lies behind the sac, except in the direct descent, when it is at its external aspect. The tumor is generally very small, but in a case described by Mr. Alexander Watson, of Edinburgh, it was of enormous bulk, containing not less than twelve feet of small, and two of large, bowel.

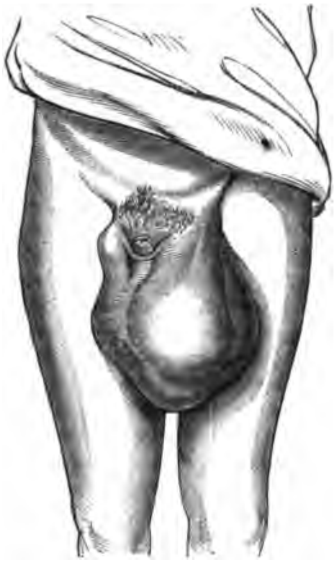
This rupture, as that of the male, may be complete or incomplete. The former generally contains intestine and omentum, but cases occur, as those observed by Sir Astley Cooper, Hesselbach, and others, in which it includes the ovary and Fallopian tube. In the incomplete variety, the parts are retained under the aponeurosis of the external oblique muscle, forming a small, oval tumor not always easy of detection.

Owing to the small size of the round ligament and of the passages through which it descends, inguinal hernia is much less frequent in women than in men. Of 885 persons affected with this disease, examined by Monnikhof, 175 were females, and 710 were males.

SCROTAL HERNIA.

Scrotal hernia is, strictly speaking, merely a form of inguinal hernia, the abdominal viscera, instead of stopping in the groin, passing down into the scrotum. The difference, it will thus be perceived, is one altogether of degree, not of kind. The affection, although sometimes congenital, is most commonly acquired, or brought about under the influence of muscular exertion, elderly subjects being most liable to it. The contents of the hernia, which is occasionally double, are various; consisting at one time of bowel alone, at another of omentum alone, and in a third series of cases, and these are perhaps the most frequent, of the two conjoined, the former in this event always lying behind the latter. The shape of the tumor is generally ovoidal, or pyriform, but instances occur in which it is cylindrical, globular, conical, or hour-glass like. Its volume is occasionally enormous. In a case which I treated some years ago it was twelve inches in length, and nearly two feet in circumference at its widest part, which was at its middle. In another case the tumor was still larger, descending nearly as low down as the knee, and being of a proportionate diameter. As a general rule, it may be stated that the size of the rupture is much less when the disease is the result of the direct descent than when it is caused by the oblique. Whenever the hernia is of unusual bulk, the penis is either partially or completely buried in its substance, thus interfering with copulation and even with micturition. Whatever may be its form and size, the testicle is situated at its base,

Fig. 408.



Scrotal hernia.

the spermatic cord being at its posterior surface. The ordinary appearances of a scrotal hernia are well depicted in fig. 408, from a patient at my clinic.

Large scrotal hernias are almost always irreducible, or, if they are not so originally, they are almost sure to become so ultimately. I have seen one case, however, in which a double rupture of this kind, of large size, remained reducible at the end of forty years. The most common causes of this occurrence are plastic adhesions between the protruded parts, or between these and the inner surface of the sac; but it happens also not unfrequently from a kind of sarcomatous enlargement of the omentum, interfering with its return through the inguinal rings. A hypertrophied state of the bowel itself is another circumstance that may render such a hernia originally reducible in time irreducible. However this may be, the patient generally experiences dragging sensations and colicky pains in the abdomen, and the bowels are almost always habitually constipated. The tumor is firm, but somewhat elastic to the touch, and quite tolerant of manipulation, except when inflamed or irritated by exercise.

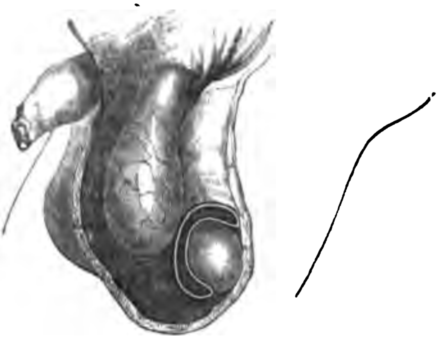
A large irreducible omental hernia occasionally produces such an amount of pressure as to cause enlargement of the testicle and spermatic cord, effusion of serum into the vaginal tunic, or suppuration of this membrane, followed, now and then, by an extension of the inflammation to the peritoneum, and the death of the patient.

The coverings of an old scrotal hernia are often very thick, dense, and firm, and not easily distinguishable from each other in case of an operation. The proper sac lies in immediate contact with the vaginal tunic of the testicle, and, in order to reach it, it is necessary to divide, in addition to the skin, the dartos, which answers here to the superficial fascia, the spermatic fascia, the cremaster muscle, and the infundibuliform process of the transverse fascia. No vessel of any importance is involved in its anatomy; in old and large scrotal hernias, however, the external pudic artery is often much enlarged, and consequently capable of furnishing a considerable hemorrhage.

Diagnosis.—Scrotal hernia is liable to be confounded with other affections, particularly with hydrocele, varicocele, and sarcocele, chiefly, however, in its earlier stages; for, when the complaint is well established, it is almost impossible to mistake its real character, except by the most superficial examination.

From *hydrocele* it may generally be easily distinguished by the following circumstances. Hernia always begins above, showing itself, in the first instance, as a tumor in the groin, from which it gradually descends into the scrotum. In hydrocele the reverse is the case, the swelling commencing below, and gradually extending upwards. In hernia the tumor is irregular in shape, and generally more or less flattened in front and behind; whereas in hydrocele it is usually pyriform, being larger below than above. In hernia the testicle is at the bottom of the tumor, while in hydrocele it is at its posterior surface, commonly above the junction of the inferior with the two superior thirds, though this arrangement is by no means constant; for in many cases of hydrocele the organ lies at the base of the swelling. In hernia the tumor is doughy, or gaseous, not elastic and fluctuating as in hydrocele; opaque, and not translucent; in the former the patient usually experiences disagreeable dragging sensations and colicky pains, especially when the protrusion is very large; while in the latter he suffers no inconvenience save what results from the volume and weight of the swelling.

Fig. 409.



A scrotal hernia; showing the usual relation of the sac to the vaginal tunic.

In reducible hernia the contents of the tumor are easily replaced when the patient is recumbent, but redescend the moment he resumes the erect posture; while in hydrocele no such changes can possibly occur, whatever may be the posture. When we add to these symptoms the fact that the spermatic cord is always behind the protruded parts in hernia, and, consequently, much less distinct in its outline than in hydrocele, in which it may almost always be felt as a firm, rounded body at the upper extremity of the tumor, and the circumstance that the opening through which the rupture has taken place may always be satisfactorily traced with the finger, while in hydrocele the inguinal rings retain their natural form; we shall have no difficulty, at least in the majority of instances, in arriving at a correct decision. Much valuable information may also be derived from the history of the case, and from the use of the exploring needle, which, whenever there is any doubt, will not fail to afford the requisite light.

Scrotal hernia and hydrocele not unfrequently coexist, constituting a combination which it may be extremely difficult to distinguish from each other. The best guides are the history of the case, and the phenomena which ordinarily characterize the two affections when occurring separately. When the diagnosis is very obscure, useful information will be furnished by the introduction of the exploring needle.

In most of these cases the hydrocele is formed first, and consequently occupies the lower part of the scrotum, being separated from the hernial sac by a kind of hour-glass constriction. Sometimes, however, the two tumors are insensibly blended together; and instances are observed—perhaps more frequently than is generally supposed—in which the hydrocele is situated directly in front of the rupture; so that, if an operation should be required, it would be necessary, in order to reach the seat of the stricture, to carry the knife across three distinct layers of serous membrane, the most deep-seated being the proper hernial sac. Such a condition is most frequent in advanced age, in connection with old bulky ruptures. The complication may be limited to one side, or there may be as many as four tumors, although this is very uncommon.

Scrotal hernia may always be readily distinguished from *varicocele* by the peculiar feel which the enlarged veins in this disease impart to the finger, which is similar to that of a bundle of earth-worms, or of the intestines of a squirrel; by the bluish appearance of the tumor; and by the circumstance that the swelling, after being effaced, is always promptly reproduced when the patient is placed erect, and pressure is applied to the external abdominal ring. In reducible hernia, on the contrary, such a procedure necessarily prevents the recurrence of the tumor. In hernia, moreover, the swelling receives a distinct impulse under coughing and other muscular exertion; while in varicocele the parts are perfectly passive.

In *sarcocele* the best guides are the history of the case, the uniform hardness of the swelling, the normal state of the abdominal rings, the inability of the surgeon to affect the volume of the tumor by manipulations, and the indurated and distended condition of the scrotum. When the disease is associated with hydrocele, a part of the tumor will be likely to be translucent, soft, and fluctuating; thus strikingly contrasting with the remainder.

Solid tumors—fibrous, adipose, sebaceous, cystic, and encephaloid—developed in the scrotum, testicle, or vaginal tunic, are, in general, easily distinguished by their progress, by their form and consistence, by the nature of the local distress, and by the presence or absence of constitutional involvement.

Treatment.—Scrotal hernia, whether reducible, irreducible, or strangulated, is treated upon the same general principles as hernia of the groin, of which, as was stated before, it is merely a continuation. A suitable truss is the proper remedy for the reducible variety, and the prospect of a permanent cure under its influence will be in proportion, all other things being equal, to the recency and small size of the tumor. The pad is, of course, placed over the internal ring, or, in cases of long standing, just above the external, the relative position of the two apertures, under such circumstances, not being forgotten. When the hernia is irreducible, it should be supported, both day and night, by a suspensory bandage, provided with shoulder-straps, otherwise it will answer the purpose but indifferently. By means of such an apparatus, the patient will be relieved of much of his inconvenience, at the same time that the tumor will be protected from further increase. Great attention should also be paid to the bowels, which should be constantly maintained in a soluble condition. The diet should be plain and simple, easy of digestion, and comprised in the smallest possible bulk, lest the alimentary tube should suffer from flatulence and fecal distension. All violent bodily exertion, fatiguing walks, and exercise on horseback must be avoided. The taxis, in case of strangulation, is conducted in the usual way; and in dividing the stricture, which will generally be found to be at the external ring, the knife is carried directly upwards.

Congenital Scrotal Hernia.—The formation of congenital scrotal hernia will readily be understood if it be remembered that the testicle is originally situated upon the psoas muscle, just below the kidney, and that, as it descends to the place which it is destined finally to occupy, it carries with it a process of the peritoneum, constituting what is called the vaginal tunic of this organ. Ordinarily, the portion of membrane lying in the inguinal canal is closed before birth, thereby cutting off all communication between the scrotum and the general abdominal cavity; but at times the reverse is the case, and then an opportunity is afforded for the protrusion of the abdominal viscera and the formation of the variety of hernia in question. Occasionally, the testicle, as it descends towards the internal ring, becomes adherent to a coil of intestine which it thus carries along with it.

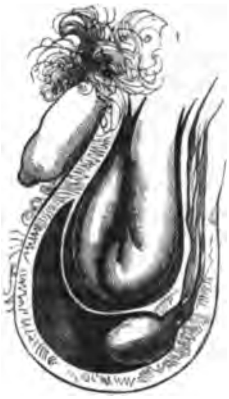
Congenital scrotal hernia is of frequent occurrence, and is capable, if neglected, of acquiring a large bulk. In a case recently under my observation, in a child only two years old, the tumor was fully as large as a fœtal head, and extended two-thirds down the thigh. In general, however, it is quite small, and easily reducible; the testicle lies at the bottom of the tumor, and the vaginal tunic, which always forms the proper hernial sac, usually contains a small quantity of water. The external coverings of the tumor are the same as in scrotal hernia of the adult. The contents commonly consist of bowel alone, generally of a fold of the ileum; in some cases, of both bowel and omentum; and occasionally, though very rarely, exclusively of omentum.

A reducible congenital scrotal hernia requires the same management as an ordinary inguinal one; but it will be well not to begin the treatment with the truss, inasmuch as it is generally impossible for the little patient to bear the pressure of such an instrument without severe suffering. Instead of this, the parts should be supported with a compress and roller, or, what is better, with a gum-elastic girdle, provided with a broad, elastic pad. In this way, an increase of the tumor may be pretty effectually prevented until the child has reached the age of eight, ten, or twelve months, when it will commonly be able to wear a truss, which may then advantageously replace the earlier and less perfect contrivance. Whatever apparatus be employed, great attention must be paid to cleanliness and to the prevention of undue irritation of the skin. If worn persistently, a radical cure may often be effected in a very short time, as the parts at that period of life always manifest a strong disposition to close after the descent of the testicle.

It is not often that a congenital scrotal hernia becomes irreducible, and it is still more rare to see it strangulated. Such an event, which has occasionally been witnessed within a few days after birth, is characterized by the ordinary phenomena, and may, in general, be promptly relieved by the taxis. If this fails, the knife must be used, but with the utmost caution, on account of the great thinness of the external coverings of the rupture, and the liability of peritonitis from the division of the vaginal tunic of the testicle, which, as before stated, forms here the proper hernial sac.

Infantile Hernia.—A very rare form of scrotal rupture is occasionally met with, generally described under the vague name of infantile hernia, fig. 410, and regarded as a subdivision of the congenital, although it has been found several times in adults who had been entirely free from all complaints of this kind in early life. Its peculiarity consists in having the vaginal tunic of the testicle in front of the proper hernial sac, so that, if a dissection be made of the parts, the protruded viscera will be seen to be invested by three distinct serous layers, besides the ordinary external coverings. In other and more explicit terms, the communication between the vaginal tunic and the abdominal cavity is completely shut up, but this membrane, instead of merely inclosing the testicle, as in the natural state, extends high up round the spermatic cord, forming thus a sort of pouch, behind which the viscera descend, in company with a prolongation of the peritoneum, which thus constitutes, as in ordinary cases of rupture, the proper hernial sac.

Fig. 410.



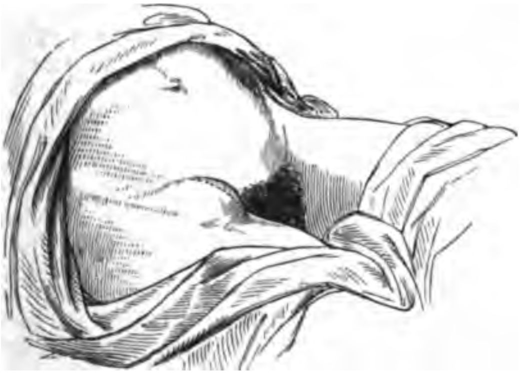
Infantile scrotal hernia.

FEMORAL HERNIA.

It would be well if the term crural could be altogether dispensed with in treating of hernia of the thigh, and the word femoral alone used. Such a course would materially simplify the subject, and relieve it of much of the confusion which has hitherto attended its study. Under this conviction, I shall limit myself in the remarks which I am about to offer upon this form of rupture, exclusively to the employment of the latter designation.

In femoral hernia, the abdominal viscera descend beneath Poupart's ligament, along what is called the femoral canal, the tumor, when fully developed, showing itself at the upper and inner surface of the thigh, as represented in fig. 411. In order to comprehend the precise relations of the protruded parts to the surrounding

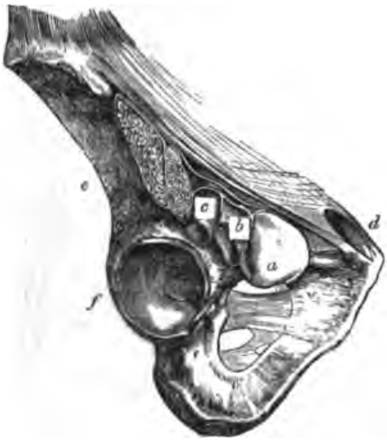
Fig. 411.



Ordinary site and appearance of femoral hernia.

structures, it will be necessary to recall a few of the anatomical elements implicated in its formation. In the first place, then, it may be observed that the passages along which the bowel courses, bear a very strong resemblance to those which are concerned in the formation of an inguinal hernia by the oblique descent, consisting, like them, of a canal and two openings, as seen in fig. 412, one denominated the internal ring, and the other the external. To render the similitude more pointed, I shall designate the openings as the femoral rings, and the intervening track as the femoral canal; in the same manner as there are two inguinal rings and an inguinal canal.

Fig. 412.



Femoral hernia. *a.* The sac. *b.* The femoral vein. *c.* The artery. *d.* The abdominal ring. *e.* Section of the psoas and iliac muscles. *f.* The acetabulum.

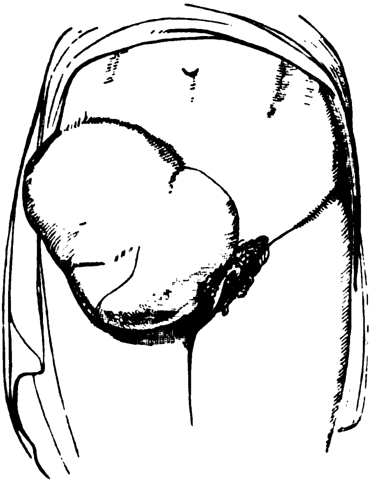
The internal femoral ring is somewhat of a triangular figure, being bounded anteriorly by Poupart's ligament, behind by the pubic bone, externally by the femoral vein, and on the inside by Gimbernat's ligament, or the third attachment of Poupart's. This opening is considerably larger in the female than in the male, and this is one, if not the principal, reason why this variety of rupture is so much more frequent in the former than in the latter. It is naturally closed by a lymphatic ganglion and a small quantity of cellulo-fatty matter, which thus generally offer not a little resistance to the descent of the abdominal viscera. The external femoral ring, usually called the saphenous opening, because it is here that the saphenous vein empties into the great femoral, is of an ovoidal shape, very spacious, and bounded by the crescentic edge which is formed here by the femoral aponeurosis. It is occupied by a number of lymphatic glands, as well as by a large mass of dense, cellulo-adipose substance, forming what is termed the *cribriform fascia*, a structure playing an important part in the anatomy of femoral hernia. The canal between the two openings now described is very short, especially in front, its wall here being formed solely by the upper lunated border of the external ring, known as Hey's ligament. The posterior wall, on the contrary, is much longer, and is represented by the pubic portion of the femoral aponeurosis. Thus constituted, the passage is lined by a prolongation of the transverse fascia in front and of the iliac behind, together with a thin layer of cellulo-adipose tissue, which, lying immediately beneath the former fascia, is continuous above with the cellulo-fatty matter which aids in filling up the internal ring, and below with the cribriform fascia. This substance, it may now be remarked, forms what is called the proper fascia of femoral hernia.

The abdominal viscera, passing down the thigh, through the openings here described, clothe themselves with a portion of peritoneum, which thus, as in the other varieties of the complaint, constitutes the proper hernial sac. If, therefore, a dissection be made of the coverings of the tumor, extending from without inwards, they will be found to present themselves in the following order:—skin, superficial fascia, cribriform fascia, the funnel-shaped process of the transverse fascia, the proper fascia, and, lastly, the peritoneum. The position of the epigastric artery and the spermatic cord is deserving of particular notice in relation to this variety of rupture. The former always lies on the outside of the tumor, close to its neck, while the latter lies above and internally. The obturator artery, when given off by a trunk common to it and the epigastric, as it is supposed to be in one case out of every four, arranges itself along the anterior and upper part of the tumor.

The contents of a femoral hernia usually consist exclusively of small intestine, generally a portion of the ileum, especially in cases of recent standing; but under opposite circumstances, and, in particular, when the tumor is bulky, both bowel and omentum frequently enter into its composition. Instances in which omentum alone protrudes are by no means uncommon; and I have a preparation, taken from an old lady of upwards of seventy, who had long labored under double femoral rupture, in which the contents are exclusively of this character. Examples are met with, although rarely, in which the tumor is composed of the ovary and Fallopian tube, of the uterus, or of the uterus, Fallopian tube, ovary, and vagina. A case has been recorded in which the urinary bladder was the part protruded. Femoral hernia occasionally coexists with inguinal.

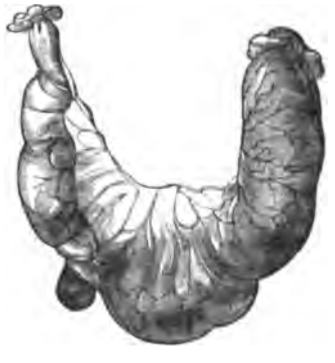
The tumor in femoral hernia is always small compared with that of inguinal hernia, seldom exceeding the size of an almond, and occasionally hardly attaining that of a nutmeg. Sometimes, however, its bulk is quite extraordinary, equalling that of a fist, or even that of a fœtal head, as in fig. 413. In the latter case, the tumor is commonly of a globular shape, whereas, ordinarily, it is of an elongated ovoidal figure, longer in the transverse diameter than in the vertical. The hernia may be complete or incomplete, as in the inguinal varieties of the complaint. In the former case, the viscera escape at the external ring, and form a tumor which lies on the upper and inner surface of the thigh, immediately below Poupart's ligament, and a little external to the spine of the pubes. In order to reach this point, the parts are obliged, upon arriving at the external ring, to change their direction, passing upwards towards the groin instead of downwards towards the knee, and in doing this the two portions are doubled upon each other. The reason of this change of direction, a knowledge of which is so important in relation to the proper employment of the taxis, is the manner in which the saphenous vein enters the femoral, and the peculiar connection of the cellular tissue, at the lower margin of the external ring, with the femoral aponeurosis. The barrier thus formed, however, is sometimes broken down, and then the hernia not only descends along the thigh, but often acquires an extraordinary bulk in consequence of the restraint being thus taken off. In the incomplete form of the disorder, the tumor is always very small; and it is on this account that the true nature of the case is very liable to be overlooked, the intercepted portion of bowel occasionally not exceeding one-third, one-half, or two-thirds of the diameter of the tube. It is, in fact, a most dangerous form of hernia, similar, in every respect, to concealed, interstitial, or interparietal hernia of the groin, described in a previous page. In the case from which the sketch, fig. 414, was taken, the protruded part was hardly the size of a pea-nut without its shell.

Fig. 413.



Femoral hernia, of very large size.

Fig. 414.



Femoral hernia, strangulated by a very small part of the bowel being caught in the femoral ring.

Femoral hernia, as already stated, is much more frequent in women than in men. Of 407 cases, analyzed by Frickhöffer, 352 occurred in females and only 55 in males. The complaint is occasionally noticed in children, but very seldom before the twelfth year.

Diagnosis.—Femoral hernia is liable to be mistaken for other affections, from which it is of the greatest consequence that it should be distinguished. Of these the most important are inguinal hernia, psoas abscess, varix of the saphenous vein, and enlargement of the lymphatic glands

In regard to the distinction between femoral and *inguinal hernia*, little difficulty can arise if it be borne in mind that, in the former, the neck of the tumor is below Poupart's ligament, while in the latter it is above. A good plan, therefore, in cases of doubt, is to trace the course of this ligament along its inner half with the finger, when, if it be found to be overlapped by the swelling, it may be assumed that the hernia is inguinal, it being well known that a femoral hernia rarely, if ever, ascends so high up. Besides, important information may be gained by a careful examination of the inguinal and femoral rings, the former of which, in particular, will always readily admit the tip of the finger when it is not occupied by the abdominal viscera. The size and shape of the tumor are not to be disregarded. In femoral hernia it is small and transversely elongated; in inguinal, on the contrary, it is comparatively large, and of an irregular, hemispherical shape. In the former, the tumor is fixed, and, when strangulated, soon becomes very tender; in the latter, it is movable, and does not suffer so early, nor are the constitutional symptoms usually so urgent.

Psoas abscess occasionally points beneath Poupart's ligament, forming a tumor, of variable size and shape, at the upper and inner part of the thigh, which may be mistaken for femoral hernia. The error will be most likely to occur when the swelling is small and recent; even then, however, a little care will generally suffice to establish the diagnosis. The best guides are the history of the case, the flexed condition of the thigh, with a certain degree of lameness, and the fact that the swelling always readily disappears under pressure during recumbency.

Varix of the *saphenous vein* at its entrance into the femoral, or of both vessels at this point, is sometimes met with, and has occasionally been treated as a femoral rupture. Such an error implies the most culpable carelessness, for it could certainly not be committed by any one who has the slightest tact or experience in examining patients. The diagnosis will always be easy when it is recollected that a varix is much softer than a femoral hernia; that it has a peculiar knotty feel; that it always coexists with varicose enlargement of the saphenous vein below; and that, after having been effaced by manipulation, it speedily reappears under pressure applied to the femoral vein just above the external ring, when the patient stands up, no such effect following if the tumor is hernial.

The *lymphatic glands*, at the upper and inner part of the thigh, are liable to enlargement, both acute and chronic, and numerous instances have occurred of errors of diagnosis between this disease and femoral hernia, a rupture having been laid open for a supposed abscess, and an inflamed ganglion treated as a rupture. It is, perhaps, not always easy to discriminate between these two affections; but it is hardly possible to conceive of a case where a careful examination of the part and a proper inquiry into the previous symptoms would not promptly dispel all doubt in relation to its real character. When symptoms of strangulation exist, along with a tumor of a suspicious nature, and one which does not promptly yield to antiphlogistic measures, the rule is to operate, both in this and in the other varieties of hernia. What complicates these cases occasionally, and embarrasses the diagnosis, is the coexistence of glandular enlargement and femoral hernia, the latter of which is then apt to be very small and concealed by the former.

Treatment.—Reducible femoral hernia must be treated with a well-adjusted truss, constructed upon the same principles as that used for inguinal hernia. It should rest over the hips midway between the crest of the ilium and the great trochanter, and should be provided with a small, slender block, very convex on the surface, and fastened to its spring nearly at a right angle. The object should be to concentrate the pressure as much as possible, which cannot be done when the pad is broad and flat, on account of the constant motion of the pectineal muscle. Care must be taken not to permit the block to exert any injurious compression upon the femoral vein, which, by embarrassing the return of the blood, might thus occasion serious mischief in the limb below, as anasarca, and even active inflammation. The precise spot where the pressure is to be made is just below Poupart's ligament, and a little external to the spine of the pubes, directly in the line of the femoral canal and the upper portion of the external ring, it being impossible, by any contrivance yet devised, to concentrate the pressure upon the internal ring. It is for this reason, in part, that a femoral hernia is so seldom radically relieved, the other causes of failure being found in the peculiar nature of the boundaries of the internal ring, these being partly osseous and partly ligamentous, and, therefore, in great measure, insusceptible of adhesive action. A truss, then, in this variety of rupture, should be worn rather as a retentive apparatus than one designed to bring about a permanent cure. Owing to the circumstance, however, just alluded to, it is questionable whether a small portion of the hernia does not generally remain above the block of the instrument, within the mouth of the internal ring.

The *irreducible* hernia of the thigh is best supported by a truss with a hollow pad, so arranged as to receive and accommodate the protruded mass, and thus protect it from further increase, as well as from external injury. A piece of tin, silver, or gutta-percha, adapted to the shape of the tumor, well padded, and provided with a narrow margin, would answer a good purpose in such a case. The neck of the pad, or the part which intervenes between the pad and the spring of the truss, might be composed of some elastic substance, to enable these two portions to move upon each other in the various attitudes of the thigh and body. A proper support of this form of rupture is particularly important, since, if it be permitted to increase, it may acquire a large bulk, and thus greatly interfere with the patient's occupation, not to mention other inconvenience, and the risk of strangulation.

For the relief of *strangulated* femoral hernia the taxis is employed; early, if possible, to obviate the necessity of an operation, and gently, in order that no harm may befall the compressed and entangled structures. It is of the greatest practical moment to remember that the symptoms here are always, other things being equal, much more urgent than in strangulated inguinal rupture, and that mortification occasionally takes place within less than twenty-four hours after the occurrence of the accident. Time, then, is a matter of immense consequence in nearly all cases of this description. With a view of affording the taxis the best chance of success, particular attention should be paid to the position of the patient, the head, shoulders, and pelvis being thoroughly elevated, the legs flexed upon the thighs, and the thighs upon the pelvis, and both limbs, but especially the affected one, strongly rotated inwards. The object of the latter procedure is to relax, as completely as possible, the lunated margin of the external ring, which, particularly in the more perfectly developed forms of the affection, always exerts a very powerful constricting influence. For want of this precaution, the practitioner, unacquainted with the anatomy of this region, often signally fails in accomplishing his object, whereas, if he pursued a proper course, he would, perhaps, experience little, if any, difficulty. The effect which this structure exerts upon the reduction of the protruded parts is well exemplified upon the dead subject, when the limb is alternately everted and inverted after a coil of intestine has been pushed through the femoral canal and brought out at the external ring. It will then be seen that the former movement invariably pinches and compresses the bowel, while the latter relaxes it, and thus places it in a better condition for prompt and safe replacement.

The important rule now described being complied with, and the patient being brought under the influence of anæsthesia, the next step is to draw the tumor downwards and slightly inwards, to efface the elbow which it forms with the femoral canal, and to bring it opposite the external ring. The parts are now pushed directly backwards, so as to get them fairly out of the reach of the lunated edge of the ring, when, the pressure being next made in an upward direction, the reduction is, in general, easily accomplished. It is seldom that the bowel ascends with a gurgling noise, unless the protrusion is large, when the sound may be as distinct as in ordinary inguinal hernia.

The length of time during which the taxis should be persisted in must, of course, be influenced by the circumstances of each particular case; but it may be stated, as a general rule, that it should be considerably less than in hernia of the groin: the efforts, too, should, if possible, be conducted with more gentleness, and no auxiliary measures, save anæsthesia and blood-letting, should ordinarily be called into requisition. If the symptoms are not urgent, or denotive of inflammation of the part and peritoneum, trial may be made, after the first failure of the taxis, of anodynes and topical applications, either cold or warm, care being taken, in the meanwhile, to maintain the body and limbs in a position favorable to spontaneous reduction. If, after a certain period, the protruded parts do not return, or if, after a second effort, the taxis again fail, the symptoms gradually, but steadily, advancing, no time should be lost in having recourse to the knife. To wait longer might endanger both the part and system.

An *operation* being determined upon, the patient is placed in the same position as in the operation for inguinal hernia, when an incision is made over the upper portion of the tumor, parallel with Poupart's ligament, and intersected by another carried down perpendicularly towards its base; or, instead of this, a T-shaped incision is made; or, if the hernia is very diminutive, a single vertical cut may suffice. The skin and cellular tissue being thus divided, the greatest caution will be required in executing the remaining steps of the operation. Layer after layer is now elevated, and divided upon the grooved director, any lymphatic glands that may come in the way of the knife being pushed aside beyond the reach of harm. The cribriform fascia is often of considerable thickness, especially in corpulent subjects, and, along with the glands involved in its substance, forms a confused mass, difficult to unravel. This having been penetrated, the next structure that presents itself is the anterior layer of the sheath of the femoral vessels, below which, and in immediate contact with the hernial sac, is a thin stratum of cellular tissue, intermixed with a few granules of fat. Dividing this, if possible, with increased caution, the operator next searches for the seat of the stricture, which will usually be found at the lunated edge of the external ring, especially at its outer and upper part, at Gimbernat's ligament, or at Poupart's ligament. This examination may be made with the grooved director, or, what is preferable, with the finger, which is followed immediately with the probe-pointed bistoury, or hernia-knife, with which the resisting structure is slightly notched, the smallest incision being generally sufficient for the purpose. The protruded parts are next gently compressed with a view of unloading the bowel of its contents, and the omentum of its blood, after which they are carefully returned into the abdomen, the sac being left intact. But it may happen that the stricture is seated within the sac, particularly if the hernia is large and old, and then the sac must, of course, be laid open, its division being effected in the same manner as in inguinal hernia, only more cautiously, because the sac is usually drawn very tightly over its contents, and seldom contains more than a few drops of serum. Finally, it may be stated that in femoral hernia, consequent upon wounds, the external coverings are sometimes so extremely thin as to permit the peristaltic motions of the bowel to be seen.

In dividing the stricture in femoral hernia, it is of the greatest consequence to remember the relations which the tumor bears to the femoral vein, the epigastric and obturator arteries, and the spermatic cord, lest these important structures should be interfered with and a copious, if not fatal, hemorrhage be the result. To accomplish this object, the safest rule is to carry the knife upwards with a very slight inclination inwards, and to keep it as much as possible behind Poupart's ligament. If the instrument were to be directed outwards, the femoral vein might be punctured, as has happened in more than one instance; if inwards, the spermatic cord might be endangered; and if too far forwards, the obturator artery, should it lie in front of the tumor, as it does when it is given off by the epigastric, might be wounded. Seeing how closely the tumor is embraced by these important structures, the surgeon should be most cautious in his movements, taking care, above all things, to make as little use of the knife as possible in dividing the stricture. It would be well, indeed, if the edge of the instrument were quite blunt, and if the necessary division were effected with a kind of sawing motion, as such a procedure would afford the vessels in question a better opportunity of escaping injury. Should hemorrhage, however, arise, despite the utmost precaution, it must at once be arrested by the ligature; or, when this is impracticable, on account of the inaccessible situation of the vessel, by means of pressure, either with the finger of a relay of assistants, or an appropriate compress and bandage, retained until all danger of bleeding is over.

The after-treatment is the same as in inguinal hernia; and similar precautions are necessary in regard to the use of the truss when the patient begins to walk about.

Anomalous forms of Femoral Hernia.—In addition to the varieties of femoral rupture above described, there are several others, which, although extremely rare, deserve brief notice. These anomalies, for so they should be considered, refer chiefly to the passage of the protruded parts and the relation which they bear to the neighboring vessels, and to the shape, size, and contents of the tumor.

Hesselbach mentions an instance in which the sac of the rupture had descended behind Poupart's ligament, between the femoral vessels and the anterior superior spinous process of the ilium. It lay under cover of the iliac portion of the femoral aponeurosis, its neck being crossed by the internal circumflex iliac artery. Mr. Stanley met with one in which the sac, about the size of a walnut, lay directly in front of the vessels; and in another case, mentioned by the same author, it passed out of the abdomen external to these vessels, but close to them.

Cloquet also describes a case in which the parts had descended in front of the vessels of the thigh. The same anatomist saw an instance in which the tumor had passed through an opening in the posterior part of the sheath, so that it lay immediately upon the pectineal muscle, and consequently behind the artery and vein, separated from them only by the deep-seated portion of the fascia.

In nearly all of these anomalous cases the epigastric artery, or this vessel and the obturator, is intimately connected with the sac of the hernia, either crossing it in front, or running closely along its inner surface. Hence, if the point of the knife be used in the division of the stricture or the deep-seated coverings of the tumor, a troublesome, if not a fatal, hemorrhage will almost be inevitable.

The surface of the femoral hernia, instead of being smooth and uniform, as it generally is, is sometimes remarkably constricted, having a kind of hour-glass appearance, caused either by the passage of a vessel of considerable size, or by the unequal compression of the overlying fascia.

Occasionally, again, the sac is multilocular, or divided into several compartments. In a case mentioned by Monro there were not less than four such cavities, of which three communicated with each other.

The parts are sometimes included in a double sac. Chevalier met with two instances in which a sac containing bowel lay within another sac, in such a manner as to fill up completely the aperture, to which it was firmly adherent. A similar case has been reported by Dupuytren.

Ordinarily the femoral rupture is very diminutive, its volume not exceeding that of a small almond or a pigeon's egg. Now and then, however, an instance occurs in which the tumor descends half way down the thigh, or fills up almost completely the space between the anterior superior spinous process of the ilium and the pubic symphysis. A unique case of a large femoral hernia, the walls of which were so thin as to permit the peristaltic motion of the bowel to be perceived, has been recorded by Thompson.

Although the femoral hernia is generally composed entirely of intestine, an instance occasionally occurs where the contents are exclusively omental. I recollect a case of double femoral rupture in an old lady, whose body I examined after death, in which each tumor contained merely a process of omentum, one of which had become much enlarged and indurated from its protracted imprisonment.

UMBILICAL HERNIA.

In umbilical hernia the abdominal viscera are protruded at the umbilical ring, or what is vulgarly called the navel. The complaint is much more frequent in women than in men. Thus, of 2775 cases of umbilical hernia reported by the London Truss Society, 2111 occurred in the female, and only 664 in the male, or in the proportion of about 100 to 24. The affection displays some variety according as it shows itself in the fœtus, in the infant, and in the adult.

a. *In the Fœtus.*—Umbilical hernia of the fœtus is always dependent upon defective development of the walls of the abdomen, and is frequently associated with malformation of other parts of the body, as hare-lip, bifid spine, club-foot, or extrophy of the bladder. In a case under my care, the infant had hypospadias and an additional finger on each hand.

The contents of an umbilical hernia usually consist of a coil of the small intestine, or of this portion of the bowel and of the colon, sometimes of the liver, occasionally of the spleen, and now and then, but very rarely, of the stomach. The affection has been noticed at a very early period of fœtal existence, though it is most common during the latter stages of pregnancy. The tumor varies in volume, according to the extent of the deficiency in the parietes of the abdomen, from that of a thimble to that of a fist. It has a proper hernial sac, but no cutaneous covering, its external investment consisting of the transparent envelop of the umbilical cord, united to the peritoneum by a thin layer of cellular tissue. The umbilical vessels are sometimes separated by the protruded viscera, and the cord is generally situated at the inferior margin of the tumor, or a little to one side of it.

When the umbilical tumor is large, death usually takes place within a few days after birth, from the effects apparently of peritoneal irritation. If the child survives, an attempt may be made to bring about a permanent cure by transfixing the edges of the umbilical ring with several delicate pins, and winding round each, in an elliptical form, a well-waxed ligature, as in the common hare-lip suture. In performing the operation care is taken not to interfere in the slightest degree with the peritoneum; the pins should be retained the better part of a week, and the abdomen should be thoroughly supported in the intervals, as well as for some time after, by broad strips of adhesive plaster, or a gum-elastic bandage.

b. *In the Child.*—Umbilical hernia in the child generally comes on within the first two or three months after birth, and cases occur where it is congenital, or where it shows itself soon after the first severe paroxysm of crying. Whatever may be the period of its evolution, the immediate cause of the disease is a succession of violent muscular efforts, by which the abdominal viscera are forcibly impelled against the umbilical aperture, before it has had time to become completely obliterated. The tumor, which rarely exceeds a common marble in bulk, is either hemispherical or conical, soft and gaseous in its consistence, and sensibly impressed by crying, laughing, coughing, or sneezing; retiring under pressure, and reappearing immediately when the pressure is removed. If, after the reduction has been effected, the finger is inserted into the opening, it will be found to be of a circular shape, with sharp and well-defined edges. The coverings of the tumor are the skin, cellular tissue, and peritoneum, its ordinary contents being small intestine; very rarely omentum, or omentum and intestine. In a case related by Cabrolius, the hernia consisted solely of the bladder, the child, a female, having been born with obstruction of the urethra. The organ soon gave way externally, so as to admit of the free discharge of the urine in this direction. At the age of eighteen, however, the natural channel was restored by operation, the fistule closed, and the hernia gradually disappeared.

An umbilical hernia in the child must be treated by the same means, or, at all events, according to the same principles, as a rupture of the same kind in the adult. If the disorder receives early attention, a radical cure may often be effected in a very short time, as there is always, at this period, a great tendency to contraction of the umbilical ring. Sometimes, indeed, the hernia disappears spontaneously, even after it has made considerable progress, especially when the general health is good, when there is not much obesity, and, above all, when care is taken to avoid the exciting causes of the complaint. Such a fortunate event, however, is very uncommon; hence the best plan always is not to wait for it, but to treat the case at once with a retentive apparatus, adapted to the age and comfort of the little sufferer. The contrivance from which most benefit is to be expected is a leather, wooden, ivory, gutta-percha, or metallic pad, of a circular shape, perfectly flat, and large enough to overlap the edges of the ring, and confined by a few broad strips of adhesive plaster, carried completely round the body. Over this, a broad gum-elastic band should be worn, in order to give due support to the whole abdomen. If the child has attained the age of two or three years, a proper truss should be used, such as that worn in this variety of hernia in the adult.

c. *In the Adult.*—In the umbilical hernia in the adult the tumor is usually globular, or pyriform, and, from not being larger originally than the end of the finger, it may, as it increases in age, acquire an enormous volume, extending, perhaps, as low down as the pubes. In corpulent persons it often manifests a disposition to insinuate itself beneath the skin, within the adipose matter, and the consequence is that it sometimes forms hardly any perceptible enlargement, as it does when the subject is emaciated. A hernia in such a state is peculiarly dangerous if it happens to become strangulated, from its liability to be overlooked, and, therefore, mismanaged. An instance of a fatal mistake of this kind occurred, some years ago, in the hands of a medical friend, a man of great intelligence, who never suspected the true nature of the disease until it was revealed by dissection after death. The patient was a married woman, whose abdomen was loaded with an enormous quantity of fat, beneath which a large, strangulated umbilical hernia existed.

An umbilical hernia in the adult generally contains omentum, or omentum and a portion of the colon; sometimes small intestine, but very rarely alone. Many years ago I dissected the body of a woman, the mother of three children, in whom the hernia was composed exclusively of the gravid uterus, near the full period of gestation. The centre of the tumor bore distinct evidence of the remains of the umbilicus. An instance of a double umbilical hernia occasionally occurs. The coverings of the tumor consist of the skin, superficial fascia, and peritoneum, the latter of which, especially in cases of long standing, is sometimes very thin, or thin at one point and thickened at another. The umbilical ring is generally towards the upper part of the tumor.

The most common causes of this form of rupture are laborious parturition, pregnancy, and habitual straining at stool. Females are much more subject to it than males, and fat persons than lean; it is rarely met with before the age of twenty-five or thirty, or until after the abdomen has become enlarged and pendulous from incessant distension of its walls. Constipation of the bowels, flatulence, colicky pains, nausea, and other evidence of gastro-intestinal disorder are common attendants upon this variety of hernia.

The *diagnosis* of umbilical hernia is generally sufficiently easy. When any difficulty arises it is usually due to the existence of a fatty tumor, an instance of which occasionally occurs in the linea alba, where, especially if it is small, it may be mistaken for an omental rupture. Scarpa very candidly confesses that he once committed an error of this kind. A woman was seized with colic and nausea, accompanied with constipation and painful tympanitis. A tumor, the size of a large nut, existed just below the umbilicus, on the left side of the middle line. Convinced that it was a strangulated hernia, an operation was performed, when it was ascertained that the tumor was merely a small mass of hard fat.

The means best calculated for the retention of a small umbilical rupture in the adult is a truss with a wooden block, at least two inches in diameter, slightly convex upon its abdominal surface, and secured to an elastic spring, long enough to encircle the body. The ends of the spring should be fastened behind to a broad, oblong pad, six inches in length, and arched transversely, to adapt it the more accurately to the spine. When there is much obesity, or great volume of tumor, the block should be proportionately larger, and the operation of the instrument should be aided by a gum-elastic supporter, which, by taking off the weight of the abdominal viscera, will thus serve to diffuse and equalize their pressure against the abdominal parietes. No truss that does not combine these qualities can be considered, under such circumstances, as of much value; for, although a radical cure can seldom be effected in any case, there is hardly a tumor, however large, inconvenient or painful, that may not be materially relieved by these means. As to the blocks and pads with a central prominence, until lately so much used in this country, it would be difficult to conceive how they could produce any other than an injurious effect, as their action must inevitably be to separate still farther the edges of the umbilical ring into which the knob projects.

One of the peculiarities of the umbilical hernia in the adult is that, if neglected or mismanaged, it soon becomes *irreducible*, either from the enlargement of its contents, or from their adhesion to each other and to the inner surface of the sac. Hence, every possible endeavor should be used to prevent this occurrence, or, if this is impracticable, to restrict it within the smallest possible limits by suitable antiphlogistic and retentive means. The existence of tenderness and pain in the tumor, constipation of the bowels, nausea, and general uneasiness in the abdomen, should be attentively watched, and regarded with suspicion. Should the symptoms increase instead of diminishing, blood should be abstracted by the lancet and by leeches, the rectum stimulated by injections, and the belly well fomented with water and laudanum. To aid in the removal of plastic matter, small doses of mercury may be used for some time after, and sorbefacients applied to the tumor. If, notwithstanding these precautions, the hernia remains irreducible, or if it was so before the surgeon was consulted, timely measures must be employed for the prevention of its further increase, as well as for its protection against external injury. The most efficient and convenient apparatus for this purpose is a hollow truss, cup-shaped, well padded, and retained in place by a scapulary, or the addition of a gum-elastic supporter. To obviate griping, flatulence, and dyspepsia, a concentrated, easily digestible diet and a soluble state of the bowels should be enjoined.

If *strangulation* ensues, no time should be lost in employing the taxis, the patient being anæsthetized, and placed pretty much in the same position as under similar circumstances in the other varieties of hernia. If the tumor is at all bulky, its contents, after having been drawn away from the umbilical ring, must be pressed directly upwards, or upwards and backwards, in a direction opposite to that of the protrusion, it being remembered that in all cases of this kind the tendency of the parts is to descend toward the pubes. Should the taxis fail, and the symptoms not be urgent, the effects of a full anodyne and of cold or warm applications may be tried, and often with a prospect of success. When we consider how disastrous have been most of the operations that have been performed for the relief of strangulated umbilical hernia, we can scarcely lay too much stress upon the protracted and judicious employment of the taxis. There is a period, of course, when we must desist, or when further efforts of the kind would be improper, but it is not always easy to specify it, and hence much must be left, in every instance, to the judgment of the practitioner.

In performing the *operation*, an inverted ⊥-shaped incision will generally be proper, the vertical limb being carried nearly an inch above the upper extremity of the tumor, directly in the course of the linea alba. Bearing in mind the thinness of the external coverings, particularly in recent cases, the knife is passed, upon a grooved director, successively through the skin and cellulo-fatty matter, down to the hernial sac, which is, if possible, left intact, experience having shown that its division is fraught with the greatest danger from its liability to be followed by fatal peritonitis. Seeking now for the seat of the stricture, which will usually be found to be at the superior margin of the ring, the knife is conducted upwards upon the finger, and the resisting structure divided to the requisite extent. The protruded parts being drawn somewhat downwards, to liberate them from their confinement, are next gently replaced into the abdomen, first bowel and then omentum, in the usual manner. Should the constriction, however, be ascertained to be within the sac, then the sac must be opened, care being taken, for the reason already mentioned, to make the incision as small as possible. When the hernia is irreducible, the protruded structures are left, after the division of the stricture, in their extra-abdominal situation.

VENTRAL, PELVIC, AND DIAPHRAGMATIC HERNIA.

Hernia may occur at other points than those where the natural openings of the abdomen exist, the names by which it is designated having reference to the particular situation of the protruded viscera, as ventral, lumbar, obturator, and ischiatic.

a. Ventral hernia is so called from the fact that it involves the parietes of the belly, which are rendered defective in consequence of a wound, or the accidental separation of some of the muscular and tendinous fibres. It may occur in any part of the walls of the abdomen, but is most common in the middle line, above the umbilicus and in the inferior half of the semilunar line. The tumor, though generally diminutive, is capable of acquiring a large bulk, and has seldom more than three coverings, namely, the skin, superficial fascia, and proper sac. The symptoms and treatment involve nothing peculiar; nor does the operation when strangulation takes place, except that special care should be taken not to injure the epigastric artery, as might happen if the stricture were divided in any other direction than the perpendicular. The sac ought also generally to be left intact for fear of violent peritonitis.

Pipelet, in the Memoirs of the French Academy of Surgery, has described a variety of ventral hernia under the name of *epigastric*, as the protrusion occurs in the region of the stomach, although no case seems to have ever been observed in which this organ was included in the tumor. The rupture is generally situated a little to the left of the middle line, in a fissure between the straight muscles, and varies in size from an ordinary marble up to that of an orange. Its chief interest arises from the fact that it commonly causes considerable gastric disturbance, as pain, flatulence, and nausea. Its contents nearly always consist of a portion of omentum, or of omentum and the arch of the colon.

b. Lumbar hernia is extremely infrequent, the only cases of it hitherto reported being those observed by Petit, Pelletan, Cloquet, and Chapplain. The protrusion, as the name implies, occurs in the loins, between the crest of the ilium and the last rib, in consequence of the accidental laceration of the abdominal muscles. The symptoms, diagnosis, and treatment are similar to those of ordinary hernia.

c. In *obturator hernia*, the viscera follow the course of the obturator vessels, forming a tumor at the upper and inner part of the thigh, under cover of the pectineal and adductor muscles, generally so small as not to be cognizable by the finger, much less by the sight. It usually consists of a portion of small bowel; is supposed to be more common in females than in males; and, owing to its deep situation, is rarely detected during life. A few cases of double obturator hernia have been observed. In the event of its becoming strangulated, reduction might possibly be effected by thoroughly relaxing the muscles of the thigh, and pushing the finger directly upwards in the course of the obturator foramen. If the taxis should fail, an operation might be required, but it would be difficult of execution, and not without danger on account of the close proximity of the femoral vessels to the line of incision. A modification of the ordinary femoral truss might answer for the retention of such a hernia when it forms a distinct external tumor.

d. The *ischiatic hernia*, which protrudes at the ischiatic notch, is extremely rare, and has probably never been recognized in the living subject. In the few cases in which it has been dissected after death, it has been found to contain small intestine: in one instance the ovary was protruded.

e. Perineal hernia descends by the side of the rectum and anus, or immediately in front of these parts, its contents generally consisting either of the small intestine or of the urinary bladder. The protruded structures do not always appear externally in the perineal region, but occasionally they form a tumor of the volume of a pullet's egg. In a case which came under my observation, some years ago, in a middle-aged lady, the mother of six children, the tumor, which lay between the vagina and rectum, and was of a very soft consistence, was about the size of an ordinary marble, and easily reducible by the slightest pressure. The most remarkable feature about it was its transparency, which was so great that the bowel could almost be seen through it. It had existed for many years, but had not been productive of any physical inconvenience.

f. Labial hernia is a very rare form of this complaint, in which the parts descend between the vagina and the branch of the ischium. The tumor, which is soft and elastic, varies in size from a small marble to a pullet's egg, readily recedes under pressure, and is usually situated in the inferior half of the great lip, beneath the mucous membrane. It is nearly always composed of a portion of bladder, the cases in which it contains intestine being extremely rare. In a woman examined by Mr. A. Burns, a hernia, occupied by the bladder, existed in each labium. The affection is distinguished from inguinal hernia by the natural state of the external ring, and by the fact that the tumor may be traced with the finger into the pelvic cavity. When the rupture becomes troublesome, it may be restrained by a pessary, or a gum-elastic bandage, the constant use of which has occasionally produced a radical cure. Strangulation is, in general, easily relieved by steady and persistent pressure; this failing, the sac is exposed, and the stricture divided in the direction of the vagina.

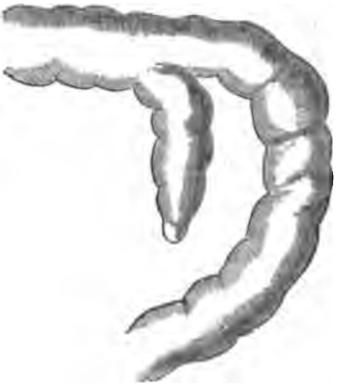
g. Vaginal hernia is merely a variety of the labial; it presents itself under two forms, the anterior and posterior, the first usually containing bladder, and the other intestine. It varies in size in different cases, being sometimes not larger than a thimble, while, at other times, it is so voluminous as to block up the whole vagina; it is of an irregular, globular shape, elastic, free from pain, influenced by coughing, and easily reduced by pressure. The treatment consists of rest in the recumbent posture, astringent injections, a hollow pessary, and an abdominal supporter, aided, when the tumor is cystic, by the occasional use of the catheter.

h. Occasionally the abdominal viscera project into the chest, thereby constituting *diaphragmatic hernia.* The left side is more frequently involved than the right, and the protruding parts usually consist of the stomach, colon, omentum, or small intestine, the order of frequency being as here stated. The liver, spleen, and even the pancreas sometimes enter into the composition of the hernia. The affection may be produced by external violence, as a fall, blow, or wound, or by severe straining in vomiting; in the majority of instances, it is the result of congenital malconstruction, attended with a separation of the muscular or tendinous fibres of the diaphragm. In the only two cases of the accident that have come under my observation, the cause, in one, was a stab in the side, through the sixth intercostal space, and, in the other, a fall from the third-story window of a house upon the brick pavement below. The wound, in both instances, was on the left side, and was large enough to admit nearly the whole of the stomach into the thoracic cavity. One of the persons died in a few hours, the other on the second day. An interesting case has been recorded by Mr. Guthrie, in which the greater part of the stomach and duodenum had passed into the chest through an opening in the diaphragm caused by a Minié ball.

In some cases the protrusion takes place through a pouch by the side of the œsophagus, aorta, or vena cava. A proper hernial sac exists only when the accident is caused by a gradual separation of the fibres of the diaphragm; in the congenital form, the peritoneum and pleura are directly continuous with each other; and in that following upon wounds and lacerations, the serous membrane is always divided along with the other structures of this musculo-aponeurotic septum. Congenital diaphragmatic hernia may coexist with bifid spine, hare-lip, or club-foot, and proves fatal in nearly half the cases at the moment of birth; a few cases survive several months, or a few years, and now and then a person attains to adult age. In diaphragmatic hernia from accident, death may take place instantly, or not for several days, weeks, months, or even years, though the latter event is extremely rare. The diagnosis of the disease is uncertain, and hence little is to be expected from treatment.

i. A very rare form of hernia, consisting in a prolongation of the bowel, was described by Littre in 1700, and is generally known by his name. It is also called *diverticular hernia.* The protruded part may be simply a congenital diverticulum, a kind of intestinal appendix, such as that represented in fig. 415, from a specimen in my cabinet, or it may exhibit itself as a blind pouch, formed by the mucous and serous coats of the bowel, the muscular having given way. The most common situation of the congenital diverticulum is the lower portion of the ilium, but it may occur also in the jejunum, the colon, and even the rectum. It is composed of the same number of tunics as the intestine, with which it is connected, and varies in length from two to four inches, its diameter being generally a little less than that of the bowel. The accidental pouch, usually very short and narrow, nearly always springs from the ilium, with which it communicates by a small, circular orifice.

Fig. 415.



Diverticulum of the small bowel.

Both of these forms of pouches may protrude at the abdominal ring, or at an artificial opening, either alone or in union with a portion of the natural bowel, and, consequently, share the same fate as an ordinary hernia. Mischief will be most likely to happen when the diverticulum becomes impacted with fecal matter or with some foreign substance, as a pea, cherry-stone, or piece of bone. Unfortunately there are no signs by which such a hernia can be distinguished from a common one. Should symptoms of strangulation arise they must be met in the usual manner; first by the use of the taxis, and, if this fail, by recourse to the knife.

j. In the *mesocolic hernia* a portion of intestine, generally the small, slips into a sac formed by the layers of the mesocolon. The occurrence is very rare, and the symptoms, when strangulation sets in, are such as characterize the ordinary varieties of the affection.

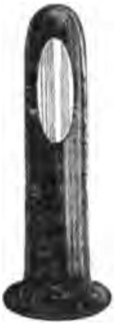
CHAPTER XV.

DISEASES, INJURIES, AND MALFORMATIONS OF THE ANUS AND RECTUM.

THE affections of the anus and lower bowel are of deep surgical interest, inasmuch as they are not only of frequent occurrence, but a source of much suffering to the patient and of great perplexity to the practitioner. In entering upon their discussion, it may be remarked, by way of introduction, that most, if not all, of the idiopathic diseases of this portion of the body are induced, maintained, or aggravated, by disorder of the digestive, urinary, and genital apparatus, and that it becomes, therefore, a matter of primary importance, as it respects the issue of our treatment, to inquire not only into the nature of their exciting causes, but also, in a special manner, into the condition of the associated organs. No progress can be made in any case without a due consideration of this kind, and without proper attention to the secretions, the bowels, and the diet. Frequent ablutions with water, or, what is better, water and soap, are most valuable auxiliaries, and cooling enemata, either simple or medicated, often remarkably expedite the cure, or, where the disease is irremediable, greatly promote the comfort of the sufferer. When the pain and inflammation are severe, the recumbent posture must be rigidly enjoined, as tending to prevent determination of blood and to allay nervous excitement. The diet, as a general rule, should be plain, simple, and unirritant; all stimulants, both in the form of food and drink, must be carefully avoided; and the mind should be kept in as tranquil a condition as possible. The effect of mental influence upon the progress and termination of diseases of the anus and rectum has not received sufficient consideration from practitioners. Any disturbance of this kind is always highly prejudicial, and should therefore be guarded against by every means in our power.

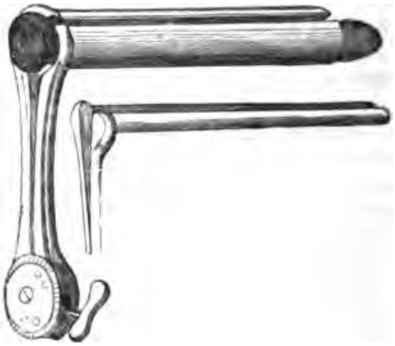
The *diagnosis* of the diseases of the anus and rectum is determined by the speculum, finger, and bougie. Before any examination, however, is attempted, the lower bowel is thoroughly emptied either by a dose of castor oil, or by a stimulating enema, otherwise embarrassment, if not positive failure, will be sure to be the consequence. This object being accomplished, the patient is placed upon his back across the bed, with the buttocks slightly elevated, and projecting a little beyond the edge of the mattress. The feet may rest upon a high chair, or the knees may be widely separated, and raised towards the chin, so as to expose the perineum; or the patient may lie upon his side, the limbs being strongly flexed upon the pelvis; or, as I usually prefer, he may rest upon his knees and forearms, the head being depressed, and the nates elevated. Whatever posture be adopted, a strong light is necessary to a satisfactory result. The speculum, warmed and well oiled, is then inserted into the anus, gently passed up the rectum, and rotated until the whole of the mucous surface is fairly brought into view. If the canal is obstructed by mucus, blood, pus, or feces, clearance is effected with a sponge-mop. The best instrument for such an examination is the one represented in fig. 416. The valvular speculum, seen in fig. 417, and so much vaunted by some, is a very inferior contrivance for such an exploration, as it permits the too easy insinuation of the mucous membrane between the blades, thereby preventing accurate inspection. Some prefer a wire instrument, but this also is inferior to the fenestrated one, here delineated. A modification of Sims's vaginal speculum is now much used in this country, and generally answers an excellent purpose, especially if the patient, at the time of the inspection, is under the influence of an anæsthetic.

Fig. 416.



Fenestrated speculum.

Fig. 417.



Valvular speculum.

Important information may often be derived from the employment of the finger, carried about in different directions in the interior of the gut; and in stricture, or obstructions from foreign bodies, the diagnosis can hardly be established without the aid of a rectum-bougie. In most cases, a delicate probe should be at hand, especially if there is reason to suspect the existence of a fistule, which cannot be properly explored in any other manner.

The administration of *injections* is seldom performed with the care and attention which its importance demands. It is an operation which any one is supposed to be capable of executing, and the consequence is that it is generally done in a very awkward and bungling manner, without at all attaining the object for which it is undertaken. Simple as, apparently, it is, it requires an amount of skill which few of those who are intrusted with its performance possess. To answer the purpose for which it is intended, the enema should, in the first place, be accurately adapted, by its quantity and quality, to the capacity and tolerance of the bowel; and, in the second place, it should be administered in such a manner as not to pain, irritate, or injure the parts. The best instrument for the purpose is a gum-elastic syringe, of the requisite size, with a long, slender nozzle, which should be well oiled, to facilitate its introduction, and carried a considerable distance up the tube, the patient lying upon his side at the edge of the bed, with the thighs somewhat bent upon the abdomen. If the patient is very restive, or unmanageable, as he may be if he is a child, or affected with delirium, he should be carefully held during the operation, otherwise the bowel may be severely wounded, or even perforated, as in an interesting case recorded by Professor Pope, of St. Louis, where a child, a few years old, lost his life from this cause. Whatever may be the object of the enema, whether purgative, stimulant, astringent, or anodyne, no air is to be introduced with it, as this is always productive of pain, and frequently completely frustrates the design of the operation. When it is desired to retain the injection for some time, and the bowel is exquisitely irritable, manifesting a constant inclination to throw off its contents, the end may sometimes be attained by the pressure of a warm cloth against the fundament. When the patient finds it necessary to employ enemata habitually, a self-injecting instrument, capable of holding a pint, and furnished with a long, curved nozzle, answers an excellent purpose, and may be used by the patient in the recumbent or semi-erect posture, as he may prefer. A stomach-pump, worked by a suction apparatus, is required when there is excessive torpor of the bowels, with pain and inability to effect an evacuation. The tube, well oiled, is carefully inserted into the rectum, and thence carried up as high as possible into the colon. An abundance of water is then thrown in to soften the fecal matter and excite the peristaltic action of the bowel. It is not always that the operation succeeds, owing to the tortuous, compressed, and displaced condition of the sigmoid flexure of the colon.

Patients affected with inflammation, neuralgia, spasm, or organic disease of the lower bowel, are often immensely benefited by the use of *anodyne suppositories*. To produce their proper effect, it is necessary that they should be of a tolerably firm consistence, conical in their shape, and inserted as high up into the tube as possible. They should, moreover, be quite smooth, free from all irritating ingredients, and well oiled previously to their introduction, which is best effected with the index-finger, also well anointed, or with a steel canula, furnished with a piston, an instrument now much used for the purpose in this city. If the bowel is distended with fecal matter, a stimulating injection precedes their use.

INJURIES OF THE RECTUM.

The rectum and anus are sometimes severely lacerated, either by accident or design. The great dangers in such an injury are hemorrhage and inflammation, occasionally extending to the peritoneum. The wound is usually caused by a fall from a considerable height, in which the buttock strikes the post of a chair, a stick, or the bough of a tree. I recollect meeting with a case, many years ago, where these parts were severely lacerated by the horn of an infuriated cow; and in 1852 I attended a young man with Dr. Knight, whose rectum was so badly torn by the post of a chair that he came very near dying from cystitis and peritonitis. Perforation of the rectum has occasionally been caused by the mal-adroit insertion of an enema syringe, a bougie, or an O'Beirne's tube.

The hemorrhage consequent upon wounds of the ano-rectal region is sometimes very abundant, amounting to many ounces, and, unless promptly arrested, leading ultimately to great exhaustion. It generally proceeds from one of the hemorrhoidal arteries, but occasionally it is almost entirely venous in its character. The blood usually flows into the bowel, from which, however, it is soon expelled, either in a semi-fluid or coagulated state; and thus the case progresses, portion after portion coming away, until, perhaps, syncope opposes a temporary barrier to its further effusion. It is astonishing with what pertinacity the bleeding sometimes continues in these cases, even when, apparently, none of the larger vessels are implicated.

Another source of danger in wounds of this region is peritonitis, particularly when the lesion extends high up, or when, as occasionally happens, the weapon penetrates the recto-vesical pouch of the serous membrane of the abdomen. The symptoms denotive of this occurrence need not be described here, but it may be stated that the practitioner should be on the constant look-out for them, that he may lose no time in combating them if they should arise. Unusual tenderness of the abdomen, with a small, quick, hard, and wiry pulse, should always excite suspicion, and induce him to redouble his vigilance. Occasionally, as in one of the cases above alluded to, the bladder is seriously implicated, and then we may have both cystitis and peritonitis along with inflammation of the anus and rectum. Sometimes, though rarely, perforation of the rectum is followed by emphysema of the lower part of the abdomen from the accidental ingress of air.

The *treatment* of wounds of the anus and rectum must be conducted according to the general principles of surgery. Hemorrhage is checked with the ligature, or, if this is impracticable, by styptics, as strong enemata of alum, tincture of chloride of iron, or spirits of turpentine, aided by exposure of the buttocks, and the application of ice; elevation of the parts, and a full opiate, not being omitted. If the ordinary means fail, plugging is had recourse to. If the wound is within reach, its edges are approximated by suture; and the bowels are kept quiescent by the usual means, the passage of fecal matter being always prejudicial. Antiphlogistics receive due attention; first, as prophylactics, and, secondly, as combatants of the inflammatory process, especially when it manifests a tendency to invade the peritoneum and bladder.

HEMORRHAGE OF THE RECTUM.

Hemorrhage of the anus and rectum may occur spontaneously, as an accompaniment of hemorrhoids, or as a consequence of ulceration, accident, or surgical operations. It may be small and insignificant, or so copious as to induce syncope and even death. The blood may accumulate by regurgitation in the colon and upper extremity of the rectum, or it may cause tenesmus, and be discharged by stool. In its character it may be arterial, or almost purely venous, large quantities of blood being sometimes lost from a wounded hemorrhoidal vein, especially when it has long been in a state of disease.

The *treatment* varies. If the bleeding proceed from numerous points, astringent enemas, the insufflation of powdered alum and tannin, ice to the anus and perineum, opium and acetate of lead, cooling drinks, and perfect quietude, with elevation of the buttocks and their exposure to the air, may suffice to arrest it. When an artery of considerable size has been divided, as indicated by the scarlet color and peculiar jet of the blood, the vessel is sought and secured with the ligature. If the artery is situated high up, it may be necessary, before this can be done, to draw down the bowel gently with the tenaculum inserted into the submucous cellular tissue, or the patient may attempt to force it down by straining as he sits upon the chamber. If ligation is impracticable, the actual cautery must be used, the parts being protected with the speculum; or digital pressure be maintained by a relay of assistants; or, finally, recourse be had to the tampon, secured by a compress and a T-bandage. The most suitable contrivance of this kind is a cylinder of gum-elastic, a hog's bladder, or a piece of oiled silk, provided with a stopcock, so as to admit of inflation or injection.

The colpeurynter, an instrument now much used by obstetricians in certain forms of uterine hemorrhage, might be advantageously resorted to in bleeding of the bowel, proceeding from numerous small vessels. It simply consists of a bag of vulcanized India-rubber, which is introduced into the rectum, and then distended with cold water, so as to make uniform pressure upon the affected surface. Sometimes the insertion of a large silver tube, similar to that occasionally used in lithotomy, will promptly arrest the bleeding, simply by allowing the ingress of air.

FOREIGN BODIES IN THE RECTUM.

Foreign bodies occasionally lodge in the rectum, causing more or less pain, inflammation, abscess, or other mischief. They may descend through the stomach, and be arrested by the sphincter muscle; or they may form in the canal itself, constituting what are called intestinal concretions; or they may be introduced through the anus, either with a view of relieving constipation, or with malicious intent. In the first case, which is by far the most common, the substances most generally consist of fragments of bone, pins, needles, coins, apple-cores, and pieces of meat, gristle. or tendon. Sometimes the rectum is distended with cherry-stones, or with undigested food, as peas, beans, and currants, which, swallowed almost in a dry state, and with hardly any mastication, escape the chymifying action of the stomach, but become swollen by the absorption of moisture in their transit through the intestinal tube, in the lower extremity of which they finally lodge, to the detriment both of the part and the neighboring organs.

Intestinal concretions, properly so-called, are uncommon in this country, if, indeed, not everywhere. The inhabitants of Scotland, owing to the peculiarity of their diet, are, perhaps, more frequently affected with them than any other people. They vary very much in their size and shape, as well as in the symptoms accompanying their development. When they descend into the rectum, they may cause serious obstruction, interfering with the evacuation of the bowels and bladder, and even with the passage of the child's head in parturition.

The foreign substance sometimes enters by the anus. Patients, in their desire to relieve themselves of stricture, hemorrhoids, or prolapse of the bowel, have been known to allow, through inadvertence, the instruments which they employed for their cure to slip out of their fingers up into the rectum. Such accidents are probably more frequent than is generally imagined, since they are often very much favored by the suction-power of the tube. Bougies, vials, bottles, and various other articles have thus occasionally found their way into the rectum. Pebbles, slate-pencils, and pieces of wood, are among the substances sometimes introduced into the lower bowel by children and hysterical females.

Foreign substances are sometimes inserted into the rectum by design, either with a view of destroying life, or for the purpose of revenge. The science of medical jurisprudence supplies numerous examples of the former; and of the latter, a memorable instance has been recorded by Marchetti, in which the but end of a pig's tail, rendered rough by cutting off the bristles, was forced up the rectum of a courtesan, by some mischievous students at the University of Göttingen.

The gut is occasionally obstructed by *indurated feces*. Old, infirm subjects are most prone to such accumulations, but they also occur in younger persons, especially in those who have become partially palsied, and who are, in consequence, unable to empty their bowels with their accustomed regularity. The quantity of fecal matter varies much in different cases. I have known it to be so large as to distend the tube apparently to its very utmost, completely paralyzing the gut, and causing intense suffering. An instance of this kind, dependent upon great torpor of the bowels, and complicated with anal fistule, fell under my observation a few years ago, in a medical gentleman, aged thirty-five. Excessive prostration existed, on account of the patient's inability to take food, as well as the depressing effects of his disease, and he had suffered immensely, for several days, from pain and spasm of the anus and rectum, before I became apprised of the true nature of his situation. Prompt relief was afforded by the removal of a large quantity of hardened feces. In another case, that of a married female, an enormous collection of indurated feces existed in the lower bowel, which had not been evacuated for a month, although the desire to do so was almost incessant.

In a case mentioned to me by Dr. Joseph Dunlap, of Norristown, great and protracted suffering was produced by excessive distension of the rectum with indurated calcined magnesia intermixed with hardened feces. The patient, a lady, aged thirty-five, had been afflicted for nearly seven years with neuralgic pains in the lower bowel and bladder, which were instantly and permanently relieved by the removal of the offending matter.

Finally, the rectum may be the seat of great discomfort from the presence of *ascarides*. Children, from the age of three to ten years, are most liable to suffer in this way, but grown persons are not exempt. The worms often occur in immense numbers, causing the most terrible itching in the part, as well as much general distress. They are usually surrounded by tough, tenacious mucus, and lodged immediately above the verge of the anus, in the rectal pouches. At times, they leave their hiding-place, and appear externally, thus at once removing all doubt respecting the real nature of the case.

The direct effect of a foreign body in the rectum is inflammation of its lining membrane, with an increased secretion of mucus, pain, and tenderness, a sense of weight, and a frequent desire to go to stool. If the substance is large, it will necessarily act obstructingly to the evacuation of the feces, and may, if long retained, lead to serious disorder of the general health, accompanied with great derangement of the bladder, and, perhaps, also of the genital organs. In severe cases there is nearly always partial prolapse of the bowel, with violent spasm of the sphincter muscles, and a discharge of bloody mucus, or even of purulent matter. The patient is sallow, dyspeptic, emaciated, and dejected.

In the *extraction* of foreign substances from the rectum, the surgeon is governed by the circumstances of each individual case. In general, when they are not situated too high up, they may readily be removed by the finger, or with a pair of forceps, the anus being previously dilated with the finger or speculum. Large alvine concretions may require to be crushed before they can be withdrawn, but such an expedient can rarely be proper, much less the division of the sphincter muscles. Should the latter, however, become necessary, on account of the extraordinary bulk of the foreign body, its awkward shape, or its slippery surface, the incision should be made in the direction of the coccyx, as less likely to cause hemorrhage and other mischief. When the substance has slipped very high up into the bowel, the extraction may be aided by counter-pressure upon the hypogastrium, thereby steadying the extraneous body, and enabling the surgeon to take a better hold upon it. To render the pressure effective, the bladder must previously be emptied.

Sharp, rough, pointed, or spiculated bodies may require to be sheathed before removal, to prevent mischief to the mucous lining. In the celebrated case of Marchetti, a strong cord was secured to the projecting extremity of the pig's tail, after which a piece of reed was slipped over it into the bowel, which was thus defended from injury. An anal speculum, or hollow bougie, open above, would answer a better purpose; or, in the absence of this, a large rectum-bougie might be used. A long bone, stretched obliquely across the bowel, with the ends firmly imbedded in its walls, may require to be broken at its middle before it can be removed; or, if it is very thin and not too hard, it may be cut in two with a pair of scissors, and each piece extracted separately.

Hardened fecal matter should be softened by repeated injections of warm water, or some mucilaginous fluid, and afterwards extracted with a scoop, or spoon, or the handle of a long slender pair of lithotomy-forceps. The operation may also be performed with a very stout, double wire, bent into a hook at the extremity, or, what is frequently better than all, the fingers. Ascarides may be dislodged in the same manner; or they may be destroyed by filling the rectum with some stimulating liquid, as a mixture of spirits of turpentine, aloes, or garlic-juice, a popular remedy often employed with much benefit.

ABSCESS OF THE ANUS.

The cellulo-adipose substance at and around the anus is liable to inflammation, often terminating in the formation of an abscess. The abscess may be of the simple phlegmonous character, or it may be essentially strumous, as when it occurs in persons predisposed to phthisis. In the former case, the symptoms are always bold and well marked, the parts being greatly swollen and excessively painful; in the latter, on the contrary, they are often so mild that the patient is hardly conscious of the presence of the morbid action. Moreover, there is a great difference in regard to the progress of the two affections. In phlegmonous abscess, the disease advances rapidly, soon reaching its crisis; matter forms in abundance, and there is apt to be extensive destruction of the surrounding cellulo-adipose tissue, causing frightful separation of the rectum and anus. In strumous abscess, on the other hand, the progress of the disease is less tardy, the matter is less copious, and there is less dissection of the bowel.

The *phlegmonous* abscess of the ano-rectal region sometimes shows itself at a very early period. I have met with it repeatedly in children under five years of age. It is generally caused by external injury, or by some irritation of the mucous membrane of the bowel, as a hemorrhoidal tumor, or the lodgment of some foreign body. The formation of matter is denoted by the usual symptoms, such as violent, tensive, throbbing pain, and an erysipelatous blush on the skin. More or less fever is present, and excessive suffering is experienced in evacuating the bowel.

The proper remedy consists in making an early and free incision, the surgeon not waiting for distinct fluctuation, well knowing that, if he does, the matter will be likely to cause extensive destruction of the cellulo-adipose tissue around the bowel, and the formation of a fistule, which he may afterwards find it extremely difficult to heal. During the incipient stages of the inflammation, preceding the deposition of matter, the case must be treated upon general antiphlogistic principles. Leeches and purgatives will be particularly beneficial.

The *strumous* abscess is often an insidious disease; the symptoms are generally very mild; there is little or no pain, perhaps, indeed, merely a sense of uneasiness; the swelling is slight, and there is seldom any sympathetic fever. The immediate cause of the disease is usually an ulcer seated low down in the rectum, admitting the ingress of mucus and feces into the circumjacent cellulo-adipose tissue. The matter exhibits the peculiar strumous peculiarities, and is often excessively offensive. The treatment is by early and free incision; but, despite this, the disease is almost invariably followed by fistule.

The bottom of the ano-rectal abscess is sometimes extremely foul, from the lodgment of dead cellulo-adipose substance, mingled with the discharges from the bowel. When this is the case, the parts must be freely divided, and washed out with solutions of the chlorides, or of nitric acid. When the skin is much riddled, or quite cribriform, as it is apt to be when the matter has been long pent up, the openings should be laid into one.

FISTULE OF THE ANUS.

One of the most frequent diseases of the anus is fistule, by which is meant an abnormal track, extending from the rectum to the surface of the skin. Occurring at all periods of life, it is most common in adults and elderly persons, childhood and old age being almost exempt from it. I have, however, witnessed it several times in young children, and in one case, in a girl only three years and a half old. Recently a boy, six years old, was brought to me at the clinic of the Jefferson Medical College, in whom the disease had begun at the age of nine months; and last winter I operated upon a case for Dr. A. C. Bournonville, of this city, in a male child only one year old.

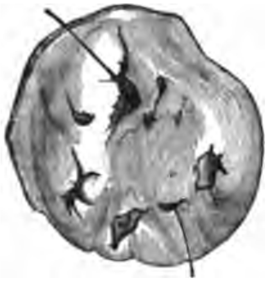
The affection is more common in men than women, but in what ratio has not been ascertained; judging from my own experience, I am inclined to look upon the difference as very marked, for, while it has occurred to me in a large number of cases in the male, I have met with very few in the female. It exists in all classes of persons, farmers, day-laborers, mechanics, merchants, lawyers, divines, and physicians. It is generally supposed, but without any positive proof, that individuals who are in the constant habit of standing and of riding on horseback are particularly prone to the disease, and writers have alleged that it is very frequent among consumptives. Of this, however, I have seen no evidence.

The immediate *cause* of this complaint is an abscess in the neighborhood of the anus, of the nature previously described, by which the lower bowel is not only more or less extensively detached from the surrounding structures, but perforated in such a manner as to admit, in many cases, of the ready passage of gas, mucus, and fecal matter. When such a communication exists the fistule is said to be complete; if, on the other hand, the wall of the bowel retains its integrity, the abnormal track extending merely from the skin to its outer surface, then the fistule is incomplete, and is called, in reference to its situation, an external blind fistule. I have seldom seen what writers have designated as an internal blind fistule, that is, a cul-de-sac, extending from the rectum, or ano-rectal cavity, into the subjacent cellular substance, without piercing the common integument. Even the external blind fistule is, I am inclined to think, much more rare than is commonly believed; for there can be no question at all that, in many instances supposed to be such, the surgeon, from awkwardness or other causes, is unable to find an opening in the rectum, when one actually exists. I have myself been repeatedly baffled in this way where the history of the case afforded the strongest evidence that the tube had been perforated.

Until the early part of the present century the opinion of surgeons respecting the situation of the *internal orifice* of anal fistule was exceedingly vague and erroneous, and the consequence was that patients were often subjected to the most cruel and dangerous operations when relief might have been obtained by the most simple, the knife being generally carried two, three, and even three inches and a half up the gut in search of the internal opening. It is now well ascertained that the aperture, instead of being placed at this altitude, is seldom more than three, four, or five lines from the verge of the anus, or the junction of the skin and mucous membrane. Sometimes it is a little further up; and instances occur, although very rarely, in which it is an inch, an inch and a quarter, or even an inch and a half above the lower outlet. The internal orifice is generally single; but I recollect the case of a gentleman, aged twenty-four, in which there were four separate openings, two on the left side, one in front, and one on the right side. They were all situated about six lines above the verge of the anus. The size of the orifice is usually small, not exceeding half a line in diameter, and its shape circular or ovoidal.

The *external orifice* is generally situated at the side of the anus, at a distance from six or eight lines to several inches. Occasionally the track opens in front towards the scrotum, or directly over the extremity of the coccyx. Its shape is usually very irregular, and its size varies in different cases, from that of a pin-head to that of half a dime. Its site is generally indicated by a small, mammillated mass of granulations, or by a small, reddish point, perhaps not larger than a flea-bite, and quite tender to the touch. The external orifice is not always single; I have repeatedly seen two, three, and even four openings, and in fig. 418, from a specimen in my collection, there are as many as seven, giving the cutaneous surface quite a cribriform aspect.

Fig. 418.



External openings in anal fistule.

The fistulous *track* itself, like its two orifices, is liable to much diversity, both as it respects its size and direction. While in some instances it is only a few lines in length, and hardly large enough to admit the finest probe, in others it is several inches, and so capacious as to permit the passage of a large instrument. In its direction it may be straight, curved, or angular; in its shape, cylindrical, slit-like, or flattened. When several such tracks exist, they generally communicate with each other laterally, although they may all concentrate at one internal orifice. Raw at first, they always become lined, soon after their formation, by a layer of lymph, which, in time, closely assimilates itself to the mucous membrane of the bowel. The abnormal track is invariably bathed with pus, or sanious fluid, and often affords vent to flatus and even fecal matter. In external blind fistule, the passage terminates above in a pouch or hollow, which is sometimes quite capacious, from the great destruction of the cellulo-adipose substance around the gut.

In consequence of the passage and retention of mucus and feces in the parts more immediately implicated in this disease, the skin and cellular tissue are often very much indurated for a considerable distance around the anus, as well as hypertrophied, discolored, and more or less tender. Sometimes small abscesses form, discharging thin, unhealthy matter; defecation is painful, the bladder is irritable, and the patient finds it difficult to sit, to ride, and even to walk much. When there has been considerable loss of cellulo-fatty substance around the fundament, the pus and fecal matter, lodging in the sac thus formed, become new sources of annoyance, inflammation, and fetor.

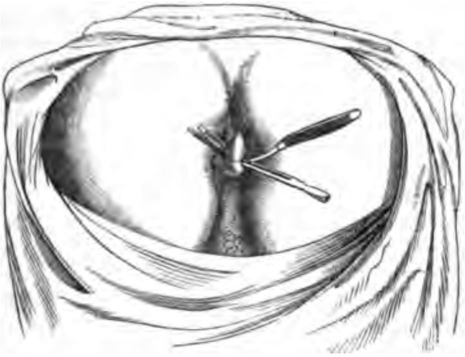
The *general health* in anal fistule does not necessarily suffer, although it is often much impaired at the time of the occurrence, or during its progress. This is more especially the case when the complaint is coincident with tubercular phthisis or other organic disease, or when the parts are unusually irritable and painful from the lodgment of pus and fecal matter, and the repeated formation of abscesses and sinuses.

The *diagnosis* of anal fistule is a matter of great interest. The existence of the disease may be suspected when there has been an abscess, more or less tedious or troublesome, in the region of the ano-rectal region; when the parts are habitually tender, tumid, and indurated; when there are one or more openings in the skin giving vent to purulent or sanguinolent discharge, sufficient to moisten the surface and stain the linen; and, finally, when the patient is conscious of the occasional escape at the abnormal openings of gas, mucus, or fecal matter. To determine the fact, however, unequivocally, a thorough exploration must be made with a common pocket probe, well oiled, and introduced through the external orifice, the existence of which is generally indicated by a small papilla on the skin. The left index-finger, inserted into the rectum, feels for the point of the instrument, and thus assists in guiding it to the internal orifice of the fistule, provided there is one, or against the side of the gut, when the fistule terminates in a cul-de-sac. As this manipulation is always productive of pain, it is hardly necessary to add that it should be conducted with the greatest possible gentleness. When the parts are much inflamed, perquisition is preceded by rest, leeches, iodine, astringents, and anodyne enemata. The morning previously, the bowel is washed out well with tepid water. If much difficulty is experienced in detecting the internal orifice, recourse is had to the speculum.

Treatment.—A patient affected with fistule of the anus may, under ordinary circumstances, be rendered comparatively comfortable by attention to his diet and bowels, and by strict observance of cleanliness. Some persons, indeed, are hardly conscious of their infirmity, so slight is their suffering; others, on the contrary, experience a great deal of local distress and even considerable impairment of the general health. When this is the case, a long course of general treatment may be necessary before we can bring about such a state of the part and system as to justify operative interference. All attempts at a radical cure are, of course, inadmissible when there is serious organic lesion in other parts of the body, especially the lungs. To arrest the local irritation and its attendant discharge would, in such an event, prove highly detrimental, by expediting the fatal crisis. Palliation alone, not cure, is sought; or cure, slow and chronic, occupying months instead of weeks in its accomplishment.

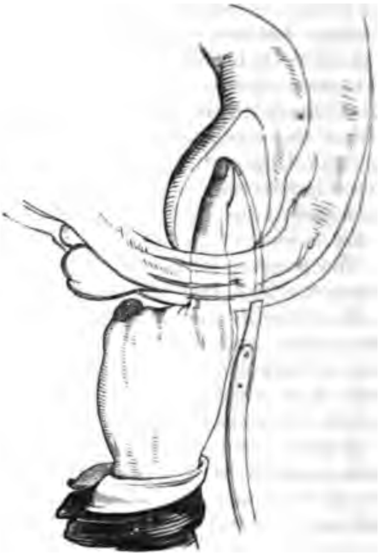
The most eligible operation for the cure of anal fistule is division of the superimposed structures with the knife, passed along a grooved director, previously inserted into the abnormal track, its extremity being brought out at the anus, and placed against the opposite buttock, as represented in fig. 419. With this precaution, the operation may be performed in a few seconds, and without the slightest risk of doing injury to the rest of the bowel. When the fistule is very short, I sometimes carry a narrow, probe-pointed bistoury through it, and effect its division in that way, counter-pressure being made against the extremity of the instrument by the finger in the rectum, as in fig. 420. When there is no internal orifice, as when the fistule is a blind external one, an opening must be made into the bowel at the usual height, with a sharp-pointed director, when the parts are divided as in the former case. In the internal blind fistule, the division may be effected over a blunt hook, inserted into the rectum, and passed into the abnormal track. When the passage is of long standing, and incrusted with organized matter, the cure will be rendered more certain, as well as more rapid, by notching its bottom, or scraping away the adventitious substance.

Fig. 419.



The author's mode of exposing and dividing the parts in anal fistule.

Fig. 420.



Mode of operating in anal fistule.

The operation being over, a thin tent, well oiled, is inserted into the wound, its superior extremity being carried several inches up the bowel, to insure its retention. A compress and T-bandage complete the dressing. The patient now goes to bed, half a grain of morphia being given to allay pain and prevent any action of the bowels for at least forty-eight hours. At the end of this time a mild laxative or an enema may be administered. The dressing is renewed daily until the wound is well covered with granulations, when it may be dispensed with. Too much stress cannot be placed upon these measures.

It is seldom that more than a few drachms of blood are lost in this operation, whereas in the old process, where the knife was carried several inches above the anus, the hemorrhage was generally quite profuse and sometimes even fatal. In cases of long standing, attended with great callosity of the parts, there is sometimes a considerable flow of blood, from an inability of the vessels to retract into the condensed cellular substance. When this happens, exposure of the wound to the cold air, and the application of pounded ice, astringent lotions, or compression, will, in general, speedily put a stop to it. Or, instead of these means, a tube, similar to that used in lithotomy, may be inserted into the bowel, so as to admit of the free passage of the air.

The operation by the *seton*, suggested by Hippocrates, and so much in vogue among charlatans, on account of its freedom from pain, and its non-interference with exercise, is certainly not without its advantages. It is particularly applicable when there are several internal openings, and also when there is danger, as in the use of the knife, of effecting too speedy a cure when the fistule is complicated with serious organic disease of the lungs, heart, or liver. In such cases we cannot be too cautious, lest, in arresting too suddenly a discharge which has perhaps become habitual, we throw the onus upon the more important organ, and thereby induce death prematurely. When, then, under such circumstances operative interference is demanded on account of the local distress, we content ourselves with the seton, aiming at a slow cure, or perhaps simply amelioration. When there is a multiplicity of internal openings, situated at different parts of the bowel, as in the instance previously adverted to, the employment of the knife could hardly fail to be followed by loss of power in the sphincter muscles. In that case, I inserted not less than three setons, and effected a complete cure in a few weeks.

The most suitable substance of which such a seton can be made is silk twist, inserted with a very slender silver probe, about two inches and a half long. The ends of the ligature are secured over a small button, having two holes at opposite points, and are tightened every second or third day, until they cut their way out, as they usually will in less than a fortnight. The patient, during all this time, may walk about and attend to his business, not neglecting, however, attention to cleanliness, and to his diet and bowels.

It cannot be denied that the most simple forms of anal fistule are now and then curable by stimulating injections, as solutions of iodine, zinc, and nitrate of silver; but the occurrence is so uncommon that the surgeon will seldom be induced to waste his patient's time by trials of this kind.

ULCERATION.

Ulcers of various kinds occur in the anus. They are most common from the twentieth to the fortieth year. Occasionally, though rarely, they are met with in children and very old subjects. They present themselves in different forms, as that of a chap, crack, or fissure, or as a small circular, oval, or oblong depression in the mucous membrane, or submucous cellular tissue. In rare cases they may extend into the muscular coat of the bowel. Their most common site is immediately within the sphincter muscle, but they may be higher up or lower down; and they may be single or multiple, common or specific. Sometimes they are seated just at the verge of the anus, partly in the skin, and partly in the mucous membrane. Persons subject to herpetic affections are particularly prone to suffer from this class of ulcers. Children and young adults are also frequently afflicted in this way, either as a result of worms, or, as is generally the case, of derangement of the digestive organs, especially dyspepsia and torpor of the liver.

The circumstances under which these ulcers are developed are often very obscure. Dysentery, chronic diarrhœa, and habitual constipation are common occasioning causes; and they frequently arise during the progress of hemorrhoids, prolapse, and other affections of the rectum. External injury, hardened feces, and foreign bodies may also produce them. The disease seldom occurs in strong and healthy individuals, but is almost invariably associated with want of power, unless it is dependent upon some local mechanical cause.

Ulcers of the anus have sometimes a syphilitic origin, owing either to direct inoculation, to extension of disease from the genital organs, or to a constitutional taint.

Finally, there is a form of follicular ulcer of the anus, or anus and rectum, dependent upon the softening of tubercular matter. It is generally connected with tubercular phthisis, and not unfrequently leads to the formation of stercoraceous abscesses and fistules.

Whatever may be the form and character of these ulcers, whether common or specific, simple or complicated, the mucous membrane, in their immediate vicinity, is generally in a state of disease, the most ordinary changes being discoloration, induration, and tumefaction. The bottom of the sores is often covered with lymph, and their edges are either flat and superficial, ragged and undermined, or elevated, hard, and everted. When large or numerous, there may be more or less discharge of pus, muco-pus, or sanies, fetid and irritating in its character.

Muco-cutaneous fissures of the anus, the *rhagades* of the older surgeons, are seldom productive of much pain, unless the bowels are permitted to become costive, or otherwise diseased, when they may cause severe suffering, and even considerable constitutional disturbance. One of the most unpleasant symptoms attending them is an itching or stinging sensation, aggravated by exercise and the use of stimulants. Tubercular ulcers seldom occasion much uneasiness, while venereal are usually very painful, and productive of constitutional disorder.

The existence of ulcers of the anus, or ano-rectal cavity, can only be determined by ocular inspection; hence the cautious use of the speculum is indispensable to a correct diagnosis. When the sores are large or numerous, the sense of touch will sometimes be sufficient to detect them, but the only certain way is to expose them to view in a good light, as this affords the surgeon an opportunity, not only of observing their seat, but also their size and condition.

In the *treatment* of ulcers of the anus and rectum, much may be done by attention to the general health, especially to the state of the digestive apparatus, which is often much deranged. The bowels must be maintained in a soluble condition by mild laxatives, such as Rochelle salts or castor oil, or, what is better, enemata of cool water, which, while they cause riddance of fecal matter, relieve congestion and promote cleanliness. In the intervals of the enemata, the parts may be soothed with small quantities of some mucilaginous fluid, containing a suitable proportion of laudanum or morphia. The diet is bland, non-stimulant, and concentrated. As far as direct applications are concerned, it is obvious that we must be governed by the nature of the ulcer. In the herpetic sores of the anus, the best topical remedies are weak yellow-wash, dilute citrine ointment, or Turner's cerate, aided by a properly regulated diet, and an occasional dose of blue mass.

When the ulcer is situated above the sphincter muscle, our main reliance is placed upon the acid nitrate of mercury, until there is a tendency to cicatrization, when the occasional use of nitrate of silver, applied as lightly as possible, may be trusted in for perfecting the cure. Syphilitic ulcers require, besides the ordinary topical remedies for that disease, the internal exhibition of mercury and iodide of potassium. Tubercular ulcers are generally intractable.

FISSURE OF THE ANUS.

This affection, originally described by Boyer, is generally situated just above the verge of the anus, extending from the skin upwards through the mucous membrane, in the form of a groove, gutter, or fissure, whence its name. It varies in length from half an inch to an inch, and in width from half a line to a line. The bottom, usually formed by the submucous cellular tissue, is of a grayish, whitish appearance, and is often incrusted with aplastic lymph. The edges are everted, tumid, and indurated. The parts around are red and inflamed. Not unfrequently the fissure extends down to the fibres of the sphincter muscle. Its favorite seat is the posterior part of the anus, but it may occur in any portion of its circumference, and cases occur in which it is double. Not long ago an instance came under my observation, in which one fissure was situated in front, opposite the perineum, and another behind, opposite the coccyx.

Fissure of the anus generally comes on without any assignable cause. The idea that it is commonly occasioned by a laceration of the mucous membrane from the pressure of indurated feces, although plausible, is not very tenable.

That it may arise in this way is unquestionable, but in most cases it will be found to be due to inflammation, the nature and source of which it is often impossible to determine. Hemorrhoids, dysentery, chronic diarrhœa, and habitual straining at stool, however induced, powerfully dispose to its occurrence. Its origin is sometimes traceable to disorder of the general health.

The characteristic symptom of this disease is the horrible pain which the patient experiences, and which often amounts to great torture, epecially during defecation, as well as for some time after; it is generally attended with violent spasmodic contraction of the sphincter muscles, tenesmus, and straining, with a sense of weight in the parts, and of soreness in the perineum, thighs, and sacrococcygeal region. The distress is always aggravated by riding on horseback, sexual intercourse, walking, and even by sitting upon a hard chair. The introduction of the finger is sure to bring on a paroxysm of suffering, almost amounting to spasm. The bladder soon becomes irritable, and intolerant of its contents; the general health gradually fails; the countenance assumes a sallow, sickly expression; the strength declines; and everything denotes the terrible impression which the disease has wrought upon the mind and body of the patient. The state of the bowels varies; sometimes they are relaxed, sometimes constipated; but, however this may be, the calls of nature are always postponed as long as possible, from the fact that the passage of the feces is invariably accompanied and followed by the most frightful agony. The diagnosis is determined by the speculum.

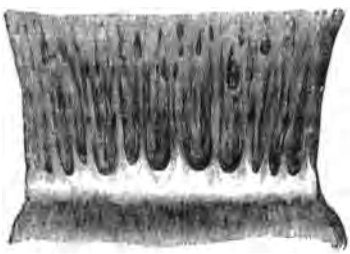
In the *treatment* of this disease the most trust-worthy agent, unquestionably, is the knife, experience having shown that local applications are of little, if any, utility. Until recently, an idea prevailed that the reason why this ulcer is generally so disinclined to heal was the motion to which it is so frequently subjected by the contraction of the sphincter muscle, and the universal practice, therefore, was to divide this muscle, as no other means could be devised to insure the complete repose of the parts. For many years I acted upon this principle, until at length I found that the division of the bottom of the fissure answered quite as well, if not better. All, indeed, that need be done, at least in the milder forms of the malady, is to scarify the bottom of the ulcer thoroughly in the direction of its length, and to trim the edges, especially if they are very hard and elevated, with the scissors. In this manner a patient who has been racked and tortured with pain and spasm for months may generally be effectually relieved in a few minutes. If the case is unusually obstinate, the knife is carried through the sphincter muscle, as in the operation for anal fissure. The after-treatment consists of recumbency, abstinence, and cold enemata, followed in three or four days by a gentle laxative.

A mode of treating this affection, originally proposed by Recamier, has lately been strongly recommended by Dr. W. H. Van Buren. It consists in forcibly dilating the anus with the index-fingers, with a view of causing temporary paralysis of the parts, and thus affording the fissure an opportunity of healing. The operation is occasionally attended with actual rupture of the fibres of the sphincter muscle.

SACS OF THE ANUS.

This affection, first described by Dr. Physick, under the name of the encysted rectum, is very uncommon. A more appropriate appellation for it would be *sacciform disease of the anus*, as it consists simply in an altered condition of the sacs, pockets, or pouches naturally existing in this situation, to the number, in many cases, of eight, ten, or even a dozen, as seen in fig. 421, from a specimen in my cabinet. These sacs are always very small in early life, but as their development is regularly progressive they are capable of acquiring a considerable size, especially if, as not unfrequently happens, they form the receptacles of hardened feces, inspissated mucus, or small extraneous bodies. From these and other causes, not always very obvious, they become the seat of morbid action, as

Fig. 421.



Pouches of the rectum.

inflammation, suppuration, and ulceration, often attended with exquisite torture. A number of pouches may be thus affected simultaneously, or one after another may become involved, until nearly the whole of the anus may suffer. The size of the individual pockets varies from that of a small depression, hardly capable of holding a split pea, up to that of a cavity large enough to admit the point of the little finger. The disorder occurs only, or principally, in old subjects, whose lower bowel is habitually distended with fecal matter, and who suffer much from congestion of the ano-rectal tissues.

Sacciform enlargement of the anus is generally tardy in its progress, and insidious in its character, its existence being frequently not suspected for years. For a long time the patient is merely conscious of uneasy sensations in the parts; vague as to their nature, and uncertain as to their recurrence. Frequently one of the earliest symptoms complained of is a feeling of pressure or weight just within the anus, or a distressing itching, similar to what is produced by the presence of ascarides. As the disorder proceeds, but generally not until it has made considerable progress, the patient begins to experience pain, especially immediately after defecation, often lasting several hours after the act has been completed; it is commonly of an aching, burning, or smarting character, and is seldom confined to the parts more immediately implicated, but is apt also to extend to the buttocks, the perineum, back, and thighs. It is not, however, after every evacuation that there is severe pain; cases occurring in which it is entirely absent, or nearly so, for days together, depending probably upon the fact that the affected pouches are sometimes completely emptied of their contents, and, of course, relieved from pressure. An increased secretion of mucus is usually observed, but it is rare, except when the sacs are inflamed or ulcerated, to see any discharge of pus. No spasm of the sphincter muscles accompanies this affection, as in fissure of the anus. To ascertain the real nature of the disease, a careful exploration is necessary, the instrument used for the purpose being a common pocket probe, the end of which is bent into a hook, and passed up and down the anus from one part of its circumference to another. As it is drawn along it becomes entangled in the valve-like fold of the sac, the seat, size, and sensibility of which are thus fully revealed, and which is generally so transparent as to allow the probe to be perceived through it. The examination is always painful, and it may, therefore, be made while the patient is under the influence of chloroform.

The proper remedy for this complaint is excision of the valve-like fold of the affected sac. To do this, all that is required is to draw it down with a tenaculum, or pair of forceps, and snip it off. If the bottom of the pouch is in an ulcerated condition, it will be well at the same time to scarify its surface, in the hope of placing it thereby in a more favorable condition for speedy reparation. If several sacs are involved, they should all be operated upon at one sitting.

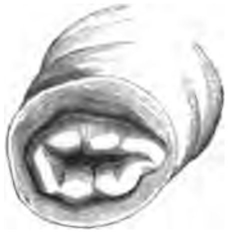
PROLAPSE OF THE RECTUM.

Prolapse of the anus, or, more properly speaking, of the rectum, presents itself under two varieties of form, the partial and the complete; the former consisting merely of a portion of the mucous membrane of the gut, the latter of the entire tube. The affection is of frequent occurrence, especially in children and aged persons, in whom it often exists in a very high degree. Various causes are capable of producing it, among which the more important are chronic diarrhœa and dysentery, habitual constipation, or constipation alternating with diarrhœa, hemorrhoids, ulcers, ascarides, and the use of drastic cathartics; anything, in short, that acts obstructingly to the evacuation of the feces and urine, may be considered as an exciting cause of the complaint. Hence, persons laboring under stricture of the urethra, enlargement of the prostate gland, or stone in the bladder, are exceedingly prone to be affected with prolapse of the lower bowel. Some of the very worst cases of the disease that I have ever met with occurred in subjects of this description. Females sometimes suffer from falling of the bowel in consequence of the straining which they experience in the evacuation of the urine and feces, from the pressure occasioned by a displaced uterus. Similar effects may be produced by a pelvic tumor. A partial displacement of the bowel occasionally attends hemorrhoids.

As predisposing *causes* of prolapse of the bowel may be enumerated constitutional debility, want of tone in the sphincter muscles of the anus, and relaxation of the intestines, however induced. Children and old persons are more prone to the disease than adults and elderly subjects. In the former, the rectum is straighter and more movable than in adolescents, the sacrum is less curved, and the abdominal viscera are more voluminous, thereby bearing more severely upon the anus and rectum during the forcible contraction of the diaphragm and abdominal muscles, both in the ordinary state and during defecation. In this way the parts becoming relaxed are readily protruded during the operation of any exciting cause, as, for example, severe and frequent straining. In old persons a predisposition to this malady is established by the relaxation of the connecting ligaments of the lower bowel, brought on by the natural wear and tear of the body.

In the *incomplete variety* of prolapse, fig. 422, the protrusion usually shows itself in the form of a fold of the mucous membrane on each side of the anus, though sometimes there may be two or even three such tumors, lying close together, or one just above another. They are, at first, always of a florid complexion, soft, spongy, elastic, and free from tenderness; but after they have existed for some time they assume a dark appearance, from the congested state of their vessels, increase in hardness, and become the seat of more or less pain. The facility with which they are returned is also much greater in recent cases; for, as they grow larger and older, the submucous cellular tissue is infiltrated with sero-plastic matter, rendering them firm and rigid, and thereby less easy of replacement, or of spontaneous reduction. When a protrusion of this kind is permanent, it is liable to become congested, inflamed, hypertrophied, rough, coriaceous, and even ulcerated; gangrene itself is not impossible, though fortunately very rare.

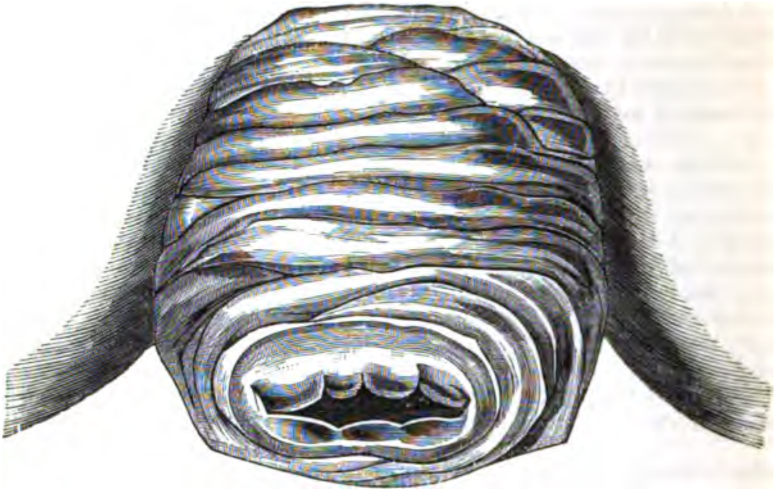
Fig. 422.



Partial prolapse of the rectum.

The *complete variety* of prolapse, fig. 423, consists essentially in an invagination of the lower bowel, the portion thus affected being at the same time propelled beyond the orifice of the anus to the extent of several inches. The ensheathed and prolapsed portion may be the middle or upper part of the rectum, or the inferior extremity of the sigmoid flexure of the colon, or all these parts may be involved at the same time. The amount of protrusion varies from the slightest possible descent of the bowel to a mass as large as a fist, a fœtal head, or even the head of an adult. The most enormous prolapse of the intestine that I have ever seen, occurred in a man thirty-five years of age. The tumor was fully as large as the crown of an ordinary-sized hat. A more bulky mass of the kind could, indeed, hardly be imagined; it seemed as if it might consist almost of the whole of the large intestine; it certainly could not have been merely the rectum and sigmoid flexure of the colon. In general, the tumor thus formed is comparatively small, not exceeding the volume of a man's fist; cylindrical in shape, truncated at the extremity, of a florid color, rugose on the surface, slightly sensitive to the touch, and readily reducible by the finger, or even ascending of its own accord, but liable to recur whenever there is the least straining at stool or micturition. When the protrusion is permanent, the parts undergo the same changes as in the partial variety of prolapse, being congested, inflamed, indurated, hypertrophied, and invested with a kind of epidermis. From constriction of the sphincter muscles the tumor is liable to strangulation, but such an occurrence is more likely to happen in recent than in old cases, which are always attended with proportionately greater relaxation of the compressing agents.

Fig. 423.



Complete prolapse of the bowel.

A protrusion of the lower bowel necessarily implies the pre-existence of a certain degree of relaxation of the parts constituting the floor of the pelvis and the muscular apparatus of the anus. So long as these several structures retain their accustomed vigor and contractile energy, no descent, however small, can occur; but when they lose their tone, the intestine being at the same time enfeebled, and subjected to inordinate pressure by the diaphragm and abdominal muscles, the accident in question can hardly fail to take place. In cases of long standing, all these parts, as I have had an opportunity of ascertaining by dissection, are not only greatly relaxed, but remarkably atrophied, the skin being attenuated and plicated, the adipose matter partially absorbed, and the fibres of the sphincter muscles pale, elongated, expanded, and almost wholly destitute of contractile power. Similar alterations occur in the fibres of the elevator muscles of the anus. That such effects should arise is very reasonable to suppose when we reflect upon the amount of traction and compression to which these structures are habitually subjected by the protruded mass.

Treatment.—In the more common forms of this accident, whether partial or complete, a cure may often be effected by very simple means. In fact, the mere removal of the exciting cause is often sufficient to afford relief. No substantial progress can be made so long as there is any mechanical obstruction in the bowels, bladder, or urethra, attended with constant straining in defecation and micturition. In all cases, whatever may be the nature of the exciting cause, it is of paramount importance to attend to the general health, which, as was previously stated, is often much at fault, the secretions being deranged, the digestion enfeebled, and the bowels either too free or too constipated. To meet these indications, the occasional use of a blue pill, or a few grains of calomel and rhubarb, or of gray powder, will be of service, followed, if necessary, in the morning by a little Epsom salts, or magnesia. When acidity and flatulence prevail, alkalies must be used along with tonics, as quinine and iron, or iron and some vegetable extract. The diet should consist mainly of bread and meat, if the patient is an adult, or of bread and milk, if he is a child, with a due allowance of rice, hominy, or potato, as a change. The skin should be maintained in a perspirable condition by the tepid bath, or daily ablutions, and frictions. In all cases, and in both forms of the disease, the sufferer should be compelled to pass his feces and urine in the recumbent posture, as the pressure which is exerted in this way by the diaphragm and abdominal muscles upon the anus and rectum is much less than when these discharges are effected in the ordinary manner. This is a point, in the treatment of prolapse of the bowel, upon which it is impossible to lay too much stress. Replacement should always be effected immediately after every protrusion, and measures should be employed, in the intervals, calculated to prevent this occurrence, as astringent enemas, containing a sufficiency of laudanum to insure the tranquillity of the parts, or a pretty full anodyne by the mouth. When the bowel is inflamed, the best remedies will be an injection of some mucilaginous fluid, and an emollient poultice to the anus. Keeping the bowels locked up for several successive days often produces the happiest result.

When, in consequence of their long extra-anal sojourn, the parts have become abnormally thickened, indurated, and stiffened, thereby impeding their restoration, great benefit will accrue from leeching, the application of a very weak solution of iodine, punctures, and scarifications. Touching the whole surface of the protruded membrane lightly but thoroughly, every third or fourth day, with the solid nitrate of silver is sometimes highly efficacious. In recent cases, more especially, it sometimes happens that the tumor becomes partially strangulated, from the constriction of the sphincter muscles; in such an event no time must be lost in effecting reduction, the efforts being promoted by the use of chloroform, and the thorough elevation of the nates, the thighs being at the same time widely separated from each other. Gentle but steady pressure being now made upon the tumor, no difficulty will generally be experienced in accomplishing our object; if the resistance, however, is obstinate, it may be promptly overcome by the subcutaneous division of the fibres of the sphincter muscles on each side of the anus.

Not much is to be expected, in any case, from the use of retentive apparatus, which can never be worn with any comfort either by the young or old, while in many instances it is productive of positive inconvenience and even suffering. Instead of this, it is much better, in both varieties of prolapse, to remove a portion of the mucous membrane, on each side of the anus, with the ligature, in the hope that during the cicatrization the caliber of the tube will diminish sufficiently to prevent relapse. One such operation will ordinarily suffice, but when the protrusion is extensive it may be necessary to repeat it; not, however, without caution, lest injurious contraction ensue.

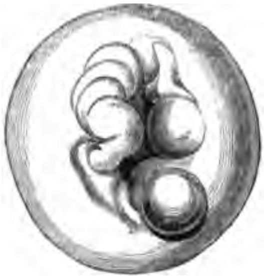
In the complete form of the affection, especially when of long standing, a more complicated course is sometimes required, consisting in the excision of some of the cutaneous folds of the ano-gluteal region. Several of these folds are raised at each side of the anus with the forceps and cut off at their base along with some of the subjacent tissues, and even a few of the muscular fibres, especially if they are much stretched and atrophied. The edges of the wounds are afterwards tacked together by several points of the interrupted suture. It will generally be well to carry the knife as far as the junction of the skin with the mucous membrane. The object of the operation, of course, is to provoke contraction of the anal orifice. When it fails, a V-shaped piece of the anus may be removed at each side, approximation being effected and maintained by suture, very much as in hare-lip. Some years ago, I assisted my friend, Professor T. G. Richardson, in such an operation, but, although it was well executed, no appreciable benefit resulted. The patient was a middle-aged woman, who had for years labored under an immense prolapse of the lower gut, attended with great and permanent relaxation of the integuments and muscles of the anus, which had resisted every mode of treatment that could be devised for its relief.

HEMORRHOIDS.

Of hemorrhoids there are two distinct varieties, differing in their situation, in their structure, and also in regard to the treatment required for their relief. Besides these, there is occasionally a dilated and varicose condition of the hemorrhoidal veins, simulating ordinary piles, and equally productive, at least in many cases, of severe suffering.

External Piles.—The most common variety of this disease is what is called the external pile, as it is always seated at the verge of the anus. It consists essentially in an extravasation of blood into the cellular tissue of the part, caused by the rupture of a hemorrhoidal vein, the tumor being covered partly by skin and partly by mucous membrane. As the effused blood always speedily coagulates, the tumor soon becomes hard, firm, and inelastic, its contents rolling out, after an incision has been practised, as a solid mass, of a dark purple color, and without any admixture of serum. The pouch in which the blood is contained is usually composed, in part, of the ruptured coats of the vein, the remainder being formed, as already stated, by the connecting areolar substance, the cells of which are generally speedily closed by plastic matter. Sometimes, again, the tumor is formed exclusively by a sac-like expansion of the vessel, attended with the solidification of its contents, both there, and for a short distance above the verge of the anus. The latter arrangement, indeed, exists in nearly all cases of external piles; hence, if an incision be made into such a tumor, and its contents pressed out, no bleeding follows, as there necessarily would if the vein were not effectually occluded by blood and lymph. The appearances of the external pile are well illustrated in fig. 424, from a preparation in my private collection.

Fig. 424.



External hemorrhoids.

It will thus be perceived that this variety of hemorrhoids bears a close resemblance to apoplexy of the parenchymatous organs, and what adds *still* farther to the similitude is that the effused blood, if not removed by operation, is either entirely absorbed, or, as more commonly happens, a portion of it remains, becoming organized, and transformed into a solid, fibroid tumor.

External piles range in size from that of a pea to that of a pigeon's egg, the most bulky being usually seated at the side of the anus, as it is there not only that the largest hemorrhoidal veins exist, but also that the greatest amount of cellular substance is found, thus admitting more readily of their expansion. In regard to their number, there may be only one, or as many as three, four, or even five, though this is rare. Their color varies with the structure of the external covering, the cutaneous part being usually light, while the mucous part is of a dark or purple aspect, owing to its greater vascularity. Their complexion is always materially heightened by inflammation. An external hemorrhoid is usually very sensitive, the patient complaining of a feeling of weight, distension, and throbbing, which is sure to be increased by the erect posture, by walking, and by whatever has a tendency to cause a flow of blood to the anus and neighboring parts. If, from these and other circumstances, it becomes irritated, the suffering is greatly aggravated, the tumor assuming a dark red appearance, at the same time that it is hot, swollen, and shining, from sero-plastic infiltration of the connecting cellular tissue. If the morbid action is not promptly checked, abscesses may form, attended with enormous tumefaction, and perhaps followed by a fistule. During the discharge of the pus small coagula escape, and as the healing process advances the hemorrhoid disappears, a radical cure taking place.

This variety of tumor sometimes occurs at a very early period, several well-marked cases having fallen under my observation in children under four years of age. Young girls are, I am inclined to believe, more liable to it than boys. After the age of puberty, however, males suffer more frequently than females.

The predisposing *causes* of external hemorrhoids are whatever has a tendency to create congestion and dilatation of the hemorrhoidal veins; as habitual accumulation of the feces in the rectum, pelvic tumors, tight lacing, venereal excesses, horseback exercise, the constant maintenance of the erect posture, and an unnatural development of these vessels, whether congenital or acquired. The exciting causes are straining at stool, impacted feces, riding on horseback, the pressure of the child's head during parturition, and, in short, whatever is capable of producing distension, and rupture of the hemorrhoidal veins.

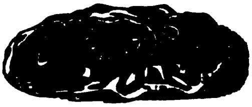
The external pile may occur alone, or it may coexist with the internal pile, as well as with various other affections, as prolapse, fissure, stricture, carcinoma, and polypoid growths. When it has once occurred, the disease is extremely liable to reappear from the slightest causes. The history of the case, and a careful inspection of the part always suffice to establish the diagnosis.

Nothing can be more simple than the *treatment* of an external pile, and yet, for the want of a correct knowledge of its anatomy, hardly any disease is more frequently mismanaged. A simple incision is generally all that is necessary to afford prompt and permanent relief. The knife being carried through the centre of the swelling, down into the sac, its contents are gently pressed out, when a little attention to rest and the use of cold applications will suffice to complete the cure. In general, indeed, the patient is able to go about his business immediately after the operation, all suffering disappearing within a few minutes after the tension has been taken off the tumor. When several hemorrhoids exist, they should all be opened at the same time; and then it will also be more necessary to keep the patient on his couch to guard against an increase of inflammation. It is seldom that the sac refills after it has been evacuated; I have, however, met with several instances where this occurrence took place promptly after the operation, evidently from a want of occlusion of the communicating hemorrhoidal vein. In such an event, further interference may either be postponed, or, if the tumor is not much inflamed, a ligature may be cast round it, and the projecting part immediately cut off with the knife.

The treatment now described should be adopted in all cases of external hemorrhoids, whatever may be their condition. The presence of a high degree of inflammation is no contraindication, but rather an argument for the practice; for, so long as the effused blood is pent up, it must necessarily be productive of mischief, by keeping up tension and irritation. Besides, as previously stated, it never fails, if it is allowed to remain, to become organized, thus leading ultimately to the formation of a tumor, which is sure to be constantly in the patient's way in walking, riding, and defecation. A portion, it is true, is always absorbed, but enough is generally left to cause more or less serious inconvenience for a long time afterwards.

Internal Piles.—The other variety of pile, usually called the internal, occult, or bleeding pile, differs very essentially in its structure from the preceding, being composed of a congeries of arteries and veins, in a varicose condition. The disease, in fact, bears a very close resemblance to an aneurism by anastomosis. The alteration which ultimately gives rise to it begins in the submucous cellular substance, the vessels of which, originally so small as to be scarcely perceptible by the naked eye, gradually enlarge until they form, in many cases, branches of considerable size, tortuous, sacculated, and arranged so as to exhibit an intricate, retiform appearance, as delineated in fig. 425. The venous branches usually predominate, both in number and volume, as well as in their varicose disposition. The walls of both classes of vessels ultimately become diseased, being thickened in some places and attenuated in others, either alone or conjoined with softening, induration, or ulceration; and, therefore, liable to give way from the slightest causes under the impulse of their contents. Hence, such tumors are not unfrequently the seat of considerable hemorrhage, both arterial and venous. The tissues which connect the diseased vessels together usually experience a certain degree of hypertrophy, though they rarely lose their softness and pliancy. The covering of the internal hemorrhoid consists simply of the mucous membrane, somewhat thickened, or thickened at one point and attenuated at another, and variously altered in color and consistence. If, therefore, a section be made of such a tumor, it will be found to exhibit a porous

Fig. 425.

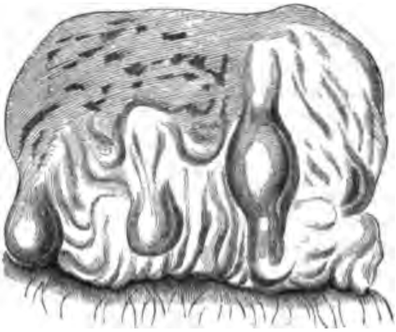


Minute structure of an internal hemorrhoidal tumor.

appearance, the apertures corresponding with the calibers of the dilated arteries and veins of the part, and the solid structure with the parietes of the vessels and their connecting cellular substance, while the peripheric layer represents the mucous tunic of the bowel.

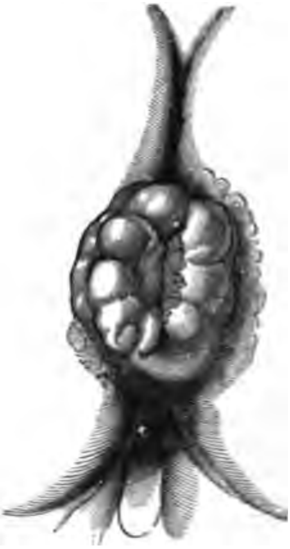
Internal piles are always situated above the verge of the anus, at a distance varying from a few lines to two inches and a half; in general, they are just above the level of the internal sphincter muscle. When numerous, they are either pretty closely grouped, or they are scattered over a considerable surface, involving, perhaps, the entire circumference of the ano-rectal outlet, as in fig. 426, from a specimen in my cabinet. It is seldom that we meet with only one such tumor; most commonly there are not less than two or three, and I have repeatedly seen as many as five, six, and even seven, varying from the size of a pea up to that of a large marble, which such growths rarely exceed, unless they are solitary or of long standing, when they may be as large as a pullet's egg.

Fig. 426.



Internal hemorrhoids.

Fig. 427.



Protruding hemorrhoid.

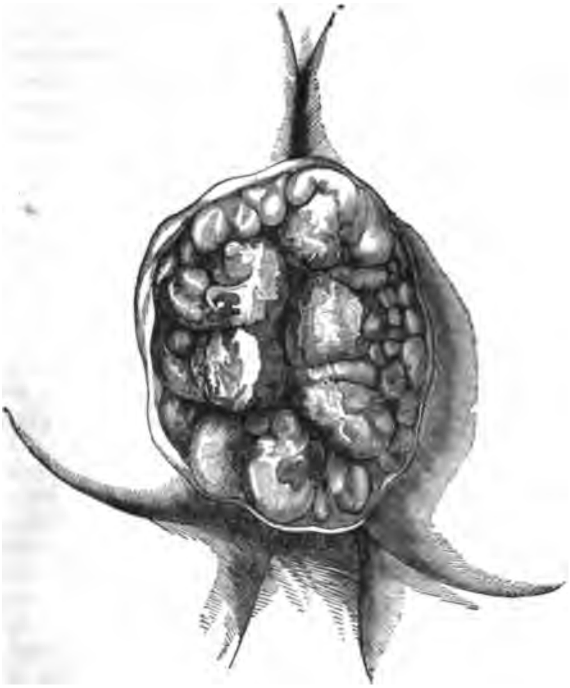
Internal hemorrhoids are ordinarily of a florid complexion, but when they are irritated or inflamed, as they necessarily must be when they are prolapsed and compressed by the sphincter muscles, they assume a dark-bluish, purple, or livid aspect, owing to the congested and stagnant condition of their vessels. The more common appearances of these tumors, as displayed during defecation, are exhibited in fig. 427.

Tumors of this kind are always soft, spongy, and erectile, diminishing under pressure, but immediately regaining their former volume when the pressure is removed. They are generally of a globular shape, and attached by a broad base; sometimes, however, they are pyriform, and in rare cases they present themselves as vertical semicylindrical ridges, upwards of an inch in length by several lines in diameter, as in fig. 426.

The surface of the internal hemorrhoid, originally smooth, often becomes roughened by deposits of lymph, or by the enlargement of the mucous villi. Ulcers are occasionally seen upon it, generally very small and superficial, but sometimes of considerable extent, and so deep as to penetrate the tumor, and cause more or less hemorrhage, thus constituting what is called a bleeding pile. The annexed engraving, fig. 428, from Ashton, exhibits an aggravated form of internal hemorrhoids, the tumors being large, unusually numerous, and ulcerated. The disease had existed for twenty years.

The internal hemorrhoid is seldom seen before the age of puberty; after that period the affection is exceedingly common, in both sexes, in different classes of society, and in different occupations. Persons who lead a sedentary life, with a gross habit of body, or who are constantly suffering from dyspepsia, or who labor habitually under constipation of the bowels, are particularly prone to the disease. Horseback exercise, the standing posture, diarrhœa, dysentery, worms, rectal tumors, drastic cathartics, and, in short, whatever produces frequent and severe straining, are so many predisposing causes of internal hemorrhoids. To the same category belong the different kinds of mechanical obstruction to the passage of the urine, as stricture of the urethra, enlargement of the prostate gland, and stone in the bladder; also the pressure of pelvic tumors, and of the gravid uterus. Under the influence of these and other causes the vessels of the submucous coat of the ano-rectal region are gradually converted into large varicose tubes, which, as they increase in volume, lift up the lining membrane, forming thus a soft, vascular, and erectile tumor.

Fig. 428.



Ulcerated hemorrhoids.

Internal piles, unless large or numerous, are not productive of much suffering, the chief symptoms being a sense of weight and stuffing in the ano-rectal region; under opposite circumstances, however, there are frequently severe pain and throbbing, sometimes extending down along the sciatic nerve, difficult defecation, and spasm of the sphincter muscles, with more or less prolapse of the anus, and also of the tumors themselves, especially when the patient is at the water closet. At such times the parts being compressed and congested, the suffering is often so exquisite as to induce free perspiration and even partial syncope; from the same causes pretty copious hemorrhage sometimes results, the blood either oozing out at various points, as from the surface of a sponge, or spirting out at one particular spot, corresponding with the orifice of an ulcerated or ruptured artery The protruded parts being replaced, as they generally have to be, with the fingers, the distress gradually subsides, the patient remaining comparatively comfortable until he is again obliged to relieve his bowels, when there is an immediate recurrence of all the previous symptoms. Thus, the disease may progress for many years, the patient being now better, now worse; liable to frequent exacerbations and remissions; generally capable of attending to business, but rarely, if ever, entirely free from suffering for a single day; more comfortable at night, while recumbent, and worse after exercise, a hearty meal, a glass of wine, severe mental emotion, or sexual indulgence. Unless there is constantly recurring hemorrhage, it is astonishing how little the general health is often impaired. I have known repeated instances in which, although the local distress was quite severe, entailing a certain amount of pain daily for many years, the individuals were able not only to attend closely to their occupation, but absolutely seemed to thrive under the disease, being robust and well-conditioned in every respect. Under such circumstances, it would really seem as if the hemorrhoidal irritation served to ward off disease from other and more important organs.

The quantity of blood lost during the progress of internal hemorrhoids is sometimes almost incredible. Cases have been recorded in which it is said to have amounted, daily, for many years, to two, three, five, six, and even eight ounces. Doubtless some of these cases have been exaggerated, but that many of them have been correctly reported is altogether probable. I have myself seen instances where the daily loss thus sustained had produced the most frightful debility. Excessive pallor of the countenance, vertigo, indistinctness of vision, ringing noises in the ears, palpitation of the heart, coldness of the extremities, indigestion, emaciation, and a tendency to dropsical effusions, are the most prominent symptoms of this occurrence. In the female, this species of hemorrhage is sometimes vicarious of the menses. It is generally most abundant during defecation, or immediately after, especially if the parts have suffered protracted protrusion.

Internal piles are sometimes seized with *gangrene*, but such an event can only happen when the tumors, prolapsed in consequence of frequent and excessive straining or inordinate relaxation of the parts, are firmly grasped by the sphincter muscles, the effect being similar to that of a ligature. The tumors then become livid, swollen, and exquisitely painful, and in a few days drop off, the patient, in the mean time, suffering much constitutional disturbance.

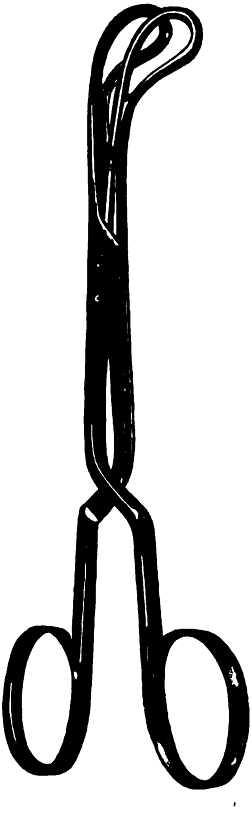
The *diagnosis* of this variety of pile is readily determined by the history of the case, by inspection, and by digital examination. The speculum can seldom be used to advantage, unless the patient is under the influence of an anæsthetic. If the disease has made considerable progress, the tumors may usually be easily brought down by requesting the patient to strain, as if at stool, while sitting on the chamber, or, what is better, in a tub of warm water. Their globular form, florid, bluish, or livid color, soft feel, and intimate attachment to the ano-rectal mucous membrane, will at once establish their identity, and serve to distinguish them from other diseases of this region. If the swellings cannot be seen, then the finger takes the place of the eye, being carried about gently, but effectually, over every portion of the bowel within its reach; aided, if need be, by the speculum.

The *treatment* of internal piles is palliative and radical. The former, which is often alone available, on account of the timidity of the patient, resolves itself chiefly into measures calculated to improve the condition of the digestive organs, to regulate the bowels, and to allay local irritation. It is wonderful how much good may frequently be done in this disease by attention to the diet and secretions, followed occasionally by a mild aperient, as blue mass and rhubarb, or sulphur and jalap. All drastic purgatives are, of course, inadmissible, especially such as have a tendency to act specifically upon the lower bowel. The diet must be plain, non-stimulant, and concentrated; wine, spirits, coffee, and strong tea are to be avoided. After the secretions have been duly attended to, from ten to fifteen drops of balsam of copaiba, in the form of emulsion, may be given three times a day, combined, if necessary, with a little black drop, especially when there is a tendency to diarrhœa. In the milder varieties of the malady, I know of no internal remedy superior to this in affording relief, though of its mode of action I am unable to offer any satisfactory or even plausible explanation. With Ward's paste, as it is termed, so much extolled by British practitioners in the treatment of internal piles, my experience is very limited, but what I have seen of its effects does not justify the encomiums lavished upon it. When the patient is in need of a tonic, the most suitable remedies will be sulphate of iron and quinine, particularly if there is an anemic state of the system. Solubility of the bowels is best maintained by the daily use of the cold water enema; and evacuation is effected habitually in the recumbent posture.

Locally, the most grateful applications are cold water, in the form of baths and enemata; mildly astringent injections, as a weak solution of acetate of lead, tannin, or alum, either alone or conjoined with an anodyne; leeching, if there is a great sense of weight and fulness in the parts; and emollient poultices, or the warm water-dressing, if the piles are protruded, inflamed, and tender. In the latter case, the free application of the solid nitrate of silver to the inflamed surface often proves highly beneficial. It need hardly be added that replacement of the tumors should always be promptly effected, whenever this is practicable, the efforts being facilitated, if necessary, by topical bleeding, either by scarification or leeching, and other means. An ointment composed of equal parts of sulphur and honey has long been a popular remedy, in certain sections of the country, in the treatment of internal hemorrhoids, and I am satisfied that it may occasionally be used beneficially, especially in the milder forms of the affection. When there is much spasm of the sphincters, belladonna ointment is worthy of trial, though I have rarely derived much advantage from it. In the hemorrhagic variety of piles, free use must be made of strongly astringent injections, persulphate of iron or of powdered alum, brought, if possible, in immediate contact with the affected surface; aided, in all cases where the bleeding is profuse, by liberal doses of opium by the mouth.

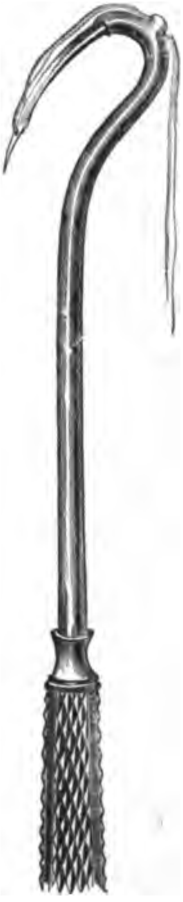
For the *radical cure* of internal piles, the proper operation is ligation, performed so as to cause prompt and effectual strangulation. The patient being under chloroform, tumor after tumor is exposed, seized with the tenaculum, or the instrument shown in fig. 429, and tied with a stout well waxed thread of saddler's silk, secured with a double knot, with the ends cut off close to the surface. If the hemorrhoids are numerous, the largest only are selected for operation, the cure of the remainder being intrusted to the resulting inflammation, which generally affords a sufficiency of plastic matter to occlude the dilated and hypertrophied vessels. Should the cure be imperfect, the recusant tumors are similarly dealt with at a future and not distant period. Such a procedure is far better than too much interference at one time, which might not be free from risk. If the hemorrhoid has an unusually broad attachment, it may be necessary to transfix its base with a large curved needle, armed with a double ligature, each of which should then be tied round the corresponding side of the morbid growth. The needle

Fig. 429.



Forceps for seizing and holding piles.

Fig. 430.



Bushe's needle-carrier.

may be passed with the fingers, or by means of Bushe's carrier, represented in fig. 430, and particularly serviceable when there is a want of sufficient assistance. The operation being over, the patient takes a full anodyne, to allay pain and paralyze the bowels, and remains in bed for five or six days—the period of the detachment of the ligatures—or until the parts are sufficiently comfortable to enable him to sit up or move about the room. No aperient medicine is administered until there is a positive necessity for its use, as indicated by the patient's feelings, and then only the mildest kind. If the parts become painful after the operation, they may be fomented, poulticed, and even leeched, or cautiously scarified, especially if, as sometimes happens, they are infiltrated with sero-plastic matter. During convalescence, as well as for a long time after, the rectum should be well washed out twice a day with cold water, or some cold, demulcent fluid.

The operation now described is, in general, as simple of execution as it is free from danger and certain in its results. Considering these circumstances, it is surprising that any surgeon should ever have thought of excision as a remedy for the radical cure of this complaint, or that it should still find a place in some of our modern treatises. Such an anomaly can only be explained on the assumption of one of two things, neither at all creditable, that is, either complete ignorance of the anatomy of this variety of piles, or the utter recklessness of the operator. To cut off an erectile tumor, composed of numerous dilated and tortuous vessels, would certainly be a most dangerous undertaking, since it could not fail to be followed by severe hemorrhage, always difficult to arrest, and sometimes fatal. Whoever has studied the memorable cases of excision of internal hemorrhoids, by Dupuytren and Cooper, will not be likely ever to repeat an operation which was attended with such disastrous results in the hands of these great men.

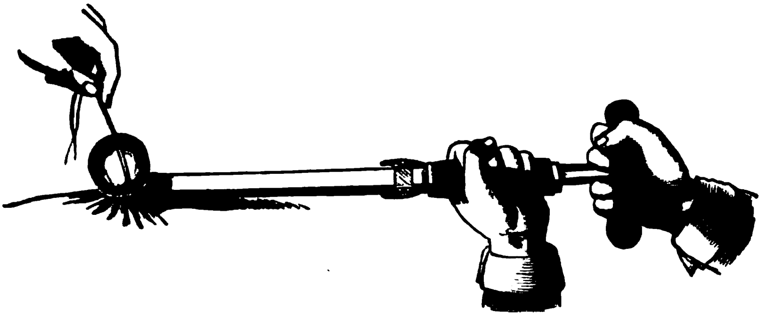
Although ligation of these tumors is generally entirely free from danger, yet, now and then, a case occurs where it causes severe pain and inflammation, or even death by pyemia. Of the latter, an instance fell under my observation many years ago in a young gentleman, otherwise in good health, who perished on the eighth day after the operation, the dissection revealing the existence of an immense number of small metastatic abscesses in the cellular tissue of the mesorectum. The ligatures were detached about the usual time, and the parts themselves exhibited nothing uncommon. Fatal cases from this cause have been reported by Astley Cooper, Benjamin Brodie, Mr. Henry Lee, and others. It should be added, however, in justice to this mode of treatment, that other methods have occasionally been followed by similar results. Thus, Nélaton lost a young man, the subject of piles, from the application of the actual cautery; and several cases are known where death was caused by the use of Vienna paste. Such mishaps, which are as distressing as they are to be deprecated, should admonish us not to interfere with hemorrhoids without due preparation of the system. Especially should operative interference be refrained from during the prevalence of epidemic disease.

The ligation of hemorrhoidal tumors is occasionally followed by tetanus. Mr. James Lane, of London, reported, in 1861, not less than four fatal cases of this disease, consequent upon this operation, two of them having occurred in his own practice, and two in that of Mr. Gowlland. It is proper, however, to add that tetanus was unusually prevalent at the time in some of the metropolitan hospitals.

The *écraseur* has of late been much used for removing internal piles. It does its work very promptly and effectually, but the operation is too painful to be borne without the aid of anæsthesia. Besides, it is said that, in Paris, where it has been more frequently employed than anywhere else, it has been followed, in a number of cases, by serious stricture of the rectum. Several instances have also occurred in which the patient perished from hemorrhage. The application of the écraseur is exhibited in fig. 431.

I have occasionlly used *nitric acid* for destroying internal piles, but with results not sufficiently gratifying to induce me to recommend its adoption as a means of radical cure, being satisfied that, while it is more difficult of application and productive of more pain and inflammation than the ligature, it is much less certain in its effects and more liable to be followed by relapse. This mode of treatment, which is adapted only to the milder forms of piles, was first suggested by the late Mr. Houston, of Dublin, and has been strongly advocated by several recent writers, among others, by Mr. Henry Lee and Mr. Henry Smith, of London, both of whom speak of it in high terms of commendation. The acid, which should be of the strongest and purest kind, is applied by means of a soft piece of wood, with a flat extremity, directly to the diseased surface, previously brought down by straining, and well wiped. The part touched, as well as the adjacent mucous membrane, is then carefully anointed with lard, and the bowel restored to its proper position. Several applications are sometimes necessary before a permanent cure is obtained.

Fig. 431.



Ecraseur in the act of removing a hemorrhoidal tumor.

VARICOSE HEMORRHOIDAL VEINS.

To the subject now discussed may be added a few remarks respecting enlargement of the hemorrhoidal veins. This affection is met with chiefly in elderly persons, in association with a varicose state of the veins of the lower extremities and of the spermatic cord. In its worst forms it always implicates a number of hemorrhoidal veins, which are then not only much dilated, but very tortuous, convoluted, and knotty, similar to what is so frequently noticed in the saphenous vein and its branches. The varicosity is always most conspicuous in the ano-rectal region, but cases occur where it extends nearly as high up as the terminations of these vessels. The enlarged vessels can easily be felt on each side of the anus, both through the skin and mucous membrane, as firm, rigid cords, with, perhaps, here and there, a phlebolite. Not unfrequently, indeed, they may be readily distinguished by their bluish appearance alone. When we consider that these vessels are destitute of valves, and that they are subjected to constant motion and pressure, it is not surprising that they should become diseased, and ultimately varicose.

Varicose enlargement of the hemorrhoidal veins should not be confounded with hemorrhoidal tumors, which it so often accompanies, as it is very different from that affection. It is characterized by a sensation of weight and fulness in the ano-pelvic region, by vague, uneasy feelings in the perineum, sacrum, and loins, and by smarting, burning, or stinging pains during defecation, and for a short time after. On inserting the forefinger into the bowel, and applying the thumb to the surface of the anus, the affected vessels may easily be felt like so many separate cords, or like scattered earth worms. The general health is not necessarily impaired, though it is often deranged, more frequently, perhaps, as a cause than as an effect of the complaint.

I imagine few surgeons would be found bold enough to attempt the obliteration of these vessels with the ligature, and yet such an operation might not, perhaps, involve any greater risk than the tying of a number of large hemorrhoidal tumors. When the disease is a source of constant suffering, linear eschars might be made over a few of the largest veins by means of the Vienna paste, a procedure which may be regarded as perfectly safe, judging from the experience we have of this treatment in varicose enlargement of the veins of the leg. Much may be done in such a case, in the way of palliation, by attention to the bowels and diet, by an avoidance of the exciting causes of the disease, by cold enemas, and by frequent ablutions with soap and water.

ANAL TUMORS.

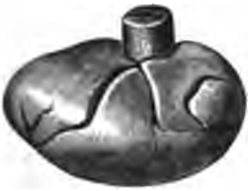
Pendulous tumors, frequently the result of external hemorrhoids, form round the anus, just at its verge, or at the junction of the muco-cutaneous surfaces. They are generally soft, irregularly globular, or pear-like in shape, smooth, or rough, and of a solid, fibroid structure. Occasionally, however, they are composed of a spongy, erectile substance, not unlike that of the cavernous body of the penis, and, therefore, liable to bleed after excision. I believe that this form of tumor is more common than has been supposed, inasmuch as a number of well-marked examples of it have fallen under my observation. Its vessels are apparently merely prolongations of the smaller hemorrhoidal veins, in a state of dilatation and varicosity, and closely invested by rather dense cellular substance. In size, such an excrescence may equal the end of the little finger; its color usually resembles that of the skin, or the muco-cutaneous tissues, to which it is attached; it is sometimes solitary, but more frequently multiple. When these growths are very numerous they may form a complete chaplet round the anus, causing much trouble in walking and defecation. Venereal warts and tubercles also occur in this situation, both in children and in adults, the former as an effect of local, the latter of constitutional, contamination. Finally, an instance of the true sebaceous tumor is occasionally seen here. It is easily recognized by its indolent character, doughy consistence, and pale color.

If troublesome, these circum-anal growths may be removed with the knife, or snipped off with the scissors. The erectile tumor should, however, always be tied, on account of its liability to hemorrhage; or, if excision has been practised, and bleeding ensue, ligation must follow the knife, the edges of the wound being raised with the tenaculum, and firmly tied. In a case of this kind, in a patient of Dr. O'Reilly, I was finally compelled, after unavailing efforts with other means, to adopt this measure, using both the twisted and the interrupted suture, profuse bleeding having come on within an hour after I had cut off five or six of these excrescences. Venereal warts may be excised, or destroyed with chromic acid, dry lint being interposed in the intervals of the application. Syphilitic tubercles require the ordinary topical and constitutional treatment. Sebaceous tumors are extirpated.

POLYPS OF THE RECTUM.

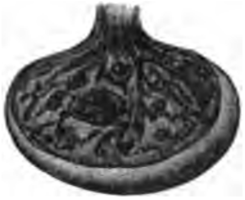
Polyps of the rectum are uncommon. Children under twelve years of age are most liable to them, but they are also met with in adults, and sometimes, though very rarely, in elderly persons. In regard to their structure, they are, like polyps of the nose and uterus, divisible into three classes, the gelatinoid, fibrous, and cellulo-vascular. As to the relative frequency of these varieties, and the circumstances which determine their development, we have no definite knowledge. They are all of tardy growth, free from malignancy, prone to hemorrhage, and liable to protrude during defecation. In their volume they vary from that of a filbert to that of a hen's egg, their shape being, for the most part, somewhat pyriform, ovoidal, or globular, while their attachment is usually effected through the medium of a slender pedicle, which is sometimes of extraordinary length. In the case of an Irishman, on whom I operated, some years ago, the polyp, which was of the cellulo-vascular variety, and not larger than an ordinary marble, had a pedicle upwards of four inches in length, and scarcely as thick as an ordinary stalk of wheat. Occasionally, on the other hand, the pedicle is very short, not exceeding a few lines. Authors speak of sarcomatous polyps of the rectum, with a tendency ultimately to take on malignant action; of this form of the disease I have never seen an instance, and am certain that it must be very rare. The distance at which these morbid growths are situated from the anus varies from two to six inches, the average being about three inches or three inches and a half. It is seldom that they are multiple. The adjoining cuts afford a good idea of the external and internal appearances of the cellulo-vascular polyp. Fig. 432 shows its shape, which, in this case, was reniform, and fig. 433 the internal structure.

Fig. 432.



Polyp of the rectum; external appearances.

Fig. 433.



Polyp of the rectum, showing its internal structure.

Persons who labor under rectal polyps generally experience a sense of weight and uneasiness in the lower part of the pelvis, with a frequent desire to relieve themselves, and more or less straining during defecation. The feces are usually somewhat flattened, and there is almost always an abundant discharge of mucus, of a glairy, reddish appearance, not unlike thin currant jelly. When the tumor is situated near the anus, or when it has an uncommonly long pedicle, it is apt to protrude during the evacuation of the bowels, and to be compressed by the sphincter muscles. At such times, too, it is liable to bleed, though this it also sometimes does when it remains undisturbed, especially if it is very vascular. In children, indeed, the loss of blood from this source is occasionally quite considerable. A tumor of this kind may be detached by the forcible contraction of the bowel, or it may slough off from the pressure exerted upon it by the sphincter muscles. The general health is commonly unimpaired.

A polyp of the rectum is usually easy of recognition. Its tardy growth, its floating nature, its occasional protrusion at the anus, and the functional disturbance which it causes in the bowel, together with the tender age of the patient, and the almost invariable existence of hemorrhage, are generally sufficiently characteristic. When any doubt obtains, a thorough digital examination will promptly dispel it. The affections which are most liable to be mistaken for it are stricture, hemorrhoids, and prolapse. In the child the existence of the disease should always be suspected when there is frequent recurring hemorrhage from the bowel.

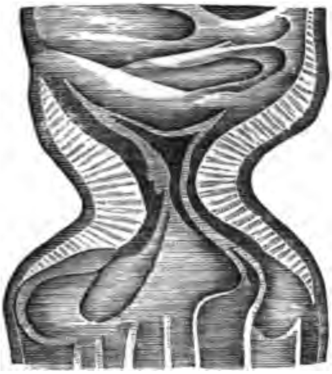
The only remedy for this disease is removal by ligature or torsion. If the tumor is small, and situated just above the verge of the anus, it may be seized with a pair of long, slender forceps, and twisted upon its axis until it drops off, the procedure being conducted in the same manner as in the removal of a nasal polyp; but, under opposite circumstances, or when the growth is very vascular, the safer plan is to tie it, and let it slough off. Finally, when this is impracticable on account of the great height of the tumor, it may readily be destroyed by crushing, or strangulation by means of the écraseur. The objection to excision is its liability to hemorrhage, which has sometimes been so great as to endanger life, and which it might be difficult to arrest, especially when the tumor is seated at a considerable distance from the anus.

STRICTURE OF THE RECTUM AND ANUS.

It is difficult to believe that simple stricture of the rectum, such as is so often witnessed in the urethra and other mucous canals, is as common as is generally supposed. My conviction is that it is one of those affections which are much more frequently described than observed. I have certainly very rarely met with it, nearly all the cases of stricture of the lower bowel that have come under my notice having been of a carcinomatous nature.

The most common *seat* of the disease is from two and a half to three inches and a half above the verge of the anus, or easily within reach of the index-finger. Affecting generally only a portion of the tube, it sometimes reaches round its entire circumference, as in fig. 434, its vertical extent being seldom less than twelve, fifteen, or eighteen lines. The degree of its encroachment upon the caliber of the gut varies from the slightest diminution to almost complete obliteration, the orifice of the stricture being sometimes scarcely large enough to admit of the passage of a goose-quill. The immediate cause of the disease is an effusion of plastic matter into the submucous cellular tissue, the other tunics retaining their integrity, or, at all events, experiencing only a slight change of consistence. This substance soon becomes organized, and gradually assumes a dense, fibrous character, creaking under the knife, and exhibiting a grayish or bluish-white appearance. The tendency of the disease is to extend inwards towards the caliber of the tube, so as to encroach upon the mucous membrane, which, although it may long retain its integrity, finally yields to the morbid action, becoming adherent to the subjacent parts, and at length ulcerated at different points. The period at which this occurs varies from several months to as many years.

Fig. 434.



Stricture of the rectum.

It is not always, or perhaps even generally, possible to trace this disease to any particular *cause*. In the very few cases that have fallen under my observation, no clue whatever could be obtained as to its origin. It is not unlikely that it may be produced by an ulcer, or, rather, by the contraction consequent upon the cicatrization of an ulcer; by inflammation arising from the lodgment of a foreign body; by the use of drastic purgatives and irritating injections; and, finally, by the application of the actual cautery, different acids, or hot water. The disease is most common in adults; and a belief prevails that women are oftener affected with it than men.

Organic stricture of the rectum manifests itself by the usual *symptoms* of alvine obstruction, attended with a frequent desire to go to stool, great straining and bearing down during defecation, and a flattened, ribbon-like shape of the excrement, when this is solid, or a remarkably forcible ejection of it when it is fluid. As the contraction progresses, the suffering increases; the bowels are habitually distended with gas and feces; colicky pains are often present; the appetite and digestion are impaired; the countenance becomes wan and sallow; the mind is despondent and filled with evil forebodings; the flesh wastes; the strength declines; and the surface is easily impressed by atmospheric vicissitudes. Finally, ulceration sets in, greatly aggravating the local and constitutional distress, and death, at length, probably after years of suffering, closes the scene.

The *diagnosis* of stricture of the rectum is seldom difficult. The diseases with which it is most liable to be confounded, are carcinoma, ulceration, and hemorrhoids. From these it may, however, generally be readily distinguished by its history and by a thorough exploration with the finger and the speculum. Cancer is usually rapid in its march, and impresses itself at an early period, in an unmistakable manner, upon the constitution.

A *syphilitic stricture* is occasionally met with in the lower bowel, caused not by any constitutional taint, but by direct inoculation with chancrous matter. The affection is much more common in women than in men, and essentially consists in a deposit of plastic substance in the submucous cellular tissue. The obstruction, generally situated just above the sphincter muscle, varies in extent from a few lines to nearly half an inch, and is often so tight as hardly to admit of the passage of the finger. The parts at and around the stricture are inflamed, highly sensitive, thickened, ulcerated, and bathed with pus, the quantity of which is often very copious. The general health is greatly impaired; the patient is wan and sallow, much emaciated, dyspeptic, despondent, and excessively irritable. The diagnosis is established by the history of the case, the unusually low situation of the obstruction, and the existence of cicatrices upon the perineum and anus, the effect of former chancres.

The *treatment* is conducted upon the same principles as in stricture of the urethra, an attempt being made to induce the absorbents to remove the plastic matter, the cause of the obstruction, by the use of bougies of successively increasing diameters. If much irritation, with inflammatory tendency, exist, a few days are spent in the employment of soothing measures, in order to render the parts more tolerant of the requisite manipulation. A small sized bougie, of gum-elastic, pewter, or sole-leather, well oiled and warmed, is carefully introduced into the stricture, where it is retained from two to five minutes, when it is withdrawn, to be again inserted at the end of forty-eight hours, to remain a similar, longer, or shorter time, according to the effect produced, it being constantly borne in mind that the object is not to excite, but to reduce, action, and to stimulate gently the absorbent vessels. After the first week, a larger instrument is used, now, perhaps, once a day, then a still larger one, and so on, until the tube has been restored to its original capacity; a circumstance, however, rarely to be expected in any case, for there is no disease more likely to prove troublesome and rebellious. When the more common bougies are not at hand, or are not borne, use may be made of a wax, tallow, or spermaceti candle. The intervals of the treatment are occupied in attention to diet and rest, the use of cooling enemata, and various other means calculated to prevent capillary excitement in the part. When the stricture is very firm, and almost impermeable, it has been proposed to notch it at four opposite points, to facilitate the passage of fecal matter and of the bougie; and such a procedure is sufficiently plausible to justify its adoption, notwithstanding what has been alleged to the contrary. The surgeon often incises strictures of the urethra, and why should he not apply the same principle of treatment to strictures of the rectum and anus? In contraction of the latter, the operation has repeatedly been followed, in my hands, by great, though not permanent relief. When the case is utterly hopeless, life may, perhaps, be prolonged by the establishment of an artificial anus in the lumbar region, provided the patient is willing to submit to so disgusting a procedure.

The syphilitic form of stricture of the rectum, or rectum and anus, must be treated with astringent and anodyne enemata, dilatation with the bougie, and cautious incisions. The general health is amended by tonics, a generous diet, and nutritious drinks. Mercury and iodide of potassium are of no avail.

CANCER OF THE ANUS AND RECTUM.

Cancer of the anus and rectum may exist as a primary disease, or as a propagation from the adjacent parts, as the uterus and vagina, or the pelvic lymphatic ganglions. The most common form in which it appears is that of scirrhus, occurring either as an infiltration in the connecting cellular substance, or as a tumor of variable size and shape, and of the consistence which ordinarily appertains to this deposit in other situations. Of encephaloid and colloid of the ano-rectal region very little is known, as they have been noticed only in a few instances. The same remark is strictly applicable to melanosis, of which I have myself witnessed only one example. The patient, a man, fifty-eight years old, labored under the same disease in nearly all the principal organs of the body, and died, after an illness of upwards of twelve months, in a state of the utmost emaciation. His principal symptoms, as it respected the anus and bowel, were, frequent discharges of muco-purulent matter, often streaked with blood, diarrhœa, griping, tenesmus, flatulence, and, at length, total loss of power in the sphincter muscles. Several black tumors, hard, irregular in shape, and about the size of small grapes, existed at the verge of the anus; and the finger, carried into the rectum, readily came in contact with a hard cancerous mass, which, on dissection, was found to consist of a mixture of scirrhus and melanosis. The prostate gland was somewhat enlarged, and the bladder had evinced great impatience of its contents during the last five or six months.

Scirrhus of the ano-rectal region is most common in elderly subjects, but I have repeatedly observed it in young adults, and a case has been reported of ulcerated cancer of the rectum in a child aged twelve years. One of the very worst examples of carcinoma of the anus, as it respected the rapidity and extent of the malady, that I have ever witnessed, occurred in a man scarcely twenty-two years old. When I first saw him the disease had already attained an extraordinary development, and was attended with great contraction of the anus. My opinion is that scirrhus in both these localities is much more common in young persons than is generally supposed. It is not known what influence, if any, sex exerts upon the production of primary cancer here; the prevalent belief is that it is most frequent in the female, but this is opposed to my experience, which has supplied me with a much larger number of cases in the male. Secondary cancer, on the contrary, is most common in women, owing to their great liability to carcinoma of the uterus, and the remarkable facility with which the malady, when it occurs here, extends to the vagina, anus, and rectum.

The ordinary *site* of the disease is at a height of two and a half to three inches from the verge of the anus, or at a point that is generally readily accessible to the finger. Examples, however, occur where it is located further up, or lower down. In the latter case, the malady sometimes coexists with scirrhus of the anus. The most common form in which the heterologous matter exhibits itself in the rectum is the tuberoid, the nodules varying in size from that of a pea to that of a pullet's egg, and in consistence from that of hard cheese to that of fibro-cartilage, their color being usually florid, grayish, or light drab. When the deposit is large, it may involve the whole circumference of the cylinder. It is generally supposed that the posterior portion of the tube is more prone to suffer than the anterior or lateral, but this is very questionable. When the morbid substance occurs as an infiltration in the wall of the rectum, it always exists most conspicuously in the submucous cellular tissue, which has a dense gristly appearance, intersected by bluish bands, which give the parts an areolar structure, similar to that of cancer of the stomach and œsophagus. When the disease is situated at the anus, it always observes the tuberiform character, and is generally attended with extraordinary hardness. In whatever form it occurs or whichever of these parts it affects, it is sure, in time, to encroach very seriously upon the caliber of the tube, and finally even to lead to such a degree of occlusion as to prevent effectually the discharge of fecal matter. I have seen numerous cases where the opening was hardly large enough to admit the point of the little finger. The tube above the seat of the obstruction may retain its natural size, or be somewhat dilated. The period which elapses from the first appearance of the disease to its ultimate termination varies, on an average, from one to two years. As a general rule, scirrhus of the rectum will be found to destroy life sooner, by several months, than scirrhus of the anus.

The *symptoms* of scirrhus of the ano-rectal region are, at first, often obscure, being such, mainly, as attend some of the other affections already described. As the disease, however, progresses it acts not only obstructingly, but gives rise to sharp, lancinating pains, extending into the thighs, nates, perineum, and sacrum and accompanied with a sense of weight and pressure low down in the pelvis. Defecation is gradually impeded; the patient is obliged to strain a great deal at stool, the calls to which are often preternaturally frequent; and the fæces are passed in a flattened, ribbon-like form, instead of being cylindrical, as in the natural state. Very often the only substance evacuated is a thick, glairy mucus, perhaps streaked with blood, or blood and pus, which are liable to be poured out in large quantity, and to escape almost incessantly, thus compelling the sufferer to wear a cloth to keep himself clean and comfortable. The bladder is usually rendered irritable, even at an early period, especially when the disease is located at the anterior wall of the rectum, or the forepart of the anus; the bowels are habitually distended with feces and gas; the general health gradually fails; the emaciation steadily progresses; and the countenance assumes the peculiar sallow aspect so characteristic of the cancerous cachexia.

The *diagnosis* is generally sufficiently simple, especially after the disease has made some progress. The peculiar character of the pain, the indurated condition of the parts, the gradual contraction of the caliber of the tube, the obstruction to defecation, the abundant mucous, or muco-puriform secretion, and its involuntary escape at the anus, the constant distension of the bowels, the flattened character of the feces, and the difficulty of introducing fluids or solids into the rectum, or through the anus, together with the progressive emaciation and failure of the general health, are always unmistakable evidences of the nature of the malady. In cancer, the rectum never descends as it does in prolapse and in hemorrhoids; no openings exist around the anus, as in fistule, at any rate very seldom; and there is not that severe spasmodic pain during defecation and for some time after, that attends fissure of the anus. Besides, in all these affections, which are more liable to simulate carcinoma than any others, a digital examination may usually be made with comparative ease, on account of the more yielding nature of the parts. Polypous growths, enlargement of the prostate gland, a retroverted uterus, and the presence of a pessary, are always easily detected by the finger.

Care should be taken not to mistake an enlargement of the lymphatic ganglions of the pelvis for this affection. These glands are liable, from various causes, as simple ulceration of the anus and rectum, and disease of the bladder, vagina, and uterus, to increase in bulk, so that they may readily be felt as hard, nodular masses through the bowel, and might thus lead to the idea of the existence of carcinoma.

The *treatment* must be conducted upon the same principles as in cancer in other situations. Palliation being all that is to be hoped for in any case, our measures must be chiefly of a soothing and detergent character, consisting of enemata of tepid water, or of tepid water and olive oil, to insure cleanliness and patency of the lower bowel, of frequent ablutions when the disease is external, or when there is much discharge, and of anodyne suppositories, or opiate injections to allay pain and spasm. Fetor is best relieved with weak lotions and enemata of permanganate of potassa. When there is much heat in the parts, attended with a sense of weight, leeches and the warm water-dressing, simple or medicated, will prove beneficial. The bowels are evacuated in the recumbent position; all sexual excitement is avoided; and the general health is carefully watched and superintended, the food being non-stimulant, concentrated, and nutritious. In the latter stages, tonics and alcoholic drinks will be necessary, with the internal use of morphia, soda, and carminatives, to calm and soothe the stomach and bowels.

The employment of the *bougie* in the treatment of cancerous affections of the ano-rectal region is of doubtful utility, if not decidedly prejudicial. During their earlier stages, and especially in cases attended with inordinate coarctation, while ulceration is not yet impending, the cautious passage of such an instrument, every third or fourth day, may be productive of some benefit in widening the tube, and thus facilitating the evacuation of its contents; but beyond this no advantage is to be anticipated, while its more frequent use could hardly fail to be a source of irritation and mischief. A gum-elastic bougie, well oiled, and retained for five or ten minutes within the constricted part, would be the most eligible instrument.

Excision promises no benefit in this disease, save temporary relief from pain and fecal obstruction. When the anus is involved, the operation must, of course, include the sphincter muscles, thereby depriving the patient of the power of controlling his passages, and the same result would be sure to follow the excision of a portion of the rectum, to say nothing, in the latter case, of the immediate risk to life from hemorrhage, peritonitis, and phlebitis. As a temporary expedient, designed to prolong existence, the rectum may occasionally be slightly notched at the contracted part, a tent being left in the bottom of the fissure to insure patency. Or, what is preferable, and less likely to cause serious hemorrhage, the stricture is broken down with the finger, or a stout bougie, well oiled and forcibly inserted. The relief which follows this operation is very great, and often lasts for months, the patient experiencing little, if any, difficulty in voiding his feces. When the disease involves the anus, any nodules at its verge or within its orifice that may be a source of obstruction or annoyance should be snipped off with the scissors, or destroyed with the actual cautery.

NEURALGIA OF THE ANUS AND RECTUM.

Neuralgia of the anus and rectum is most common in persons of a nervous, irritable temperament, from the age of twenty-five to fifty; it usually coexists, or alternates, with attacks of a similar kind in other parts of the body, particularly the face, stomach, testicle, mamma, and bladder. It is characterized by paroxysms of pain, which is generally described as of a tearing, burning, or lancinating nature, situated at the extremity of the lower bowel, from which it is apt to extend to the sacrum, loins, pubes, and genito-urinary organs. Defecation is exquisitely painful, and the urine is discharged in jets or drops, attended with a scalding sensation. The attacks commonly subside in from five to ten hours, to recur with tolerable regularity about the same period the next day, though sometimes not until the second or third. During the intermissions, the patient is, in great degree, free from pain, and passes his feces and urine without difficulty. The affection often continues for years, and the paroxysms are then apt to be more frequent and irregular, recurring perhaps every few hours.

The causes of neuralgia are various. It often arises from disease of the ano-rectal region, or from the pressure exerted upon the lower bowel by an enlarged prostate or a retroverted womb. In hemorrhoids, strictures, fissure, and other maladies, the pain frequently derives its chief severity from its neuralgic character. Sometimes the disease is of a miasmatic origin, especially in persons living in malarious regions, infested with intermittent fever. When this is the case, it generally recurs in regular paroxysms, once every twenty-four hours or every third day. Again, cases occur in which it appears to be owing simply to derangement of the digestive apparatus, as dyspepsia, constipation, worms, or disordered biliary secretion. Neuralgia of the anus and rectum frequently alternates with neuralgia of other parts. I recollect several cases in which it was thus associated with neuralgia of the chest, face, and testes. In the female, the malady is sometimes connected with dysmenorrhœa. The most atrocious attacks of this disease that I have ever witnessed were caused by the impaction in the rectum of indurated fecal matter.

As this disease never proves fatal, it is impossible to affirm what its real pathology is. In our examinations of such cases, we occasionally detect, a short distance above the anus, or even within the anus itself, a small spot, so exquisitely sensitive as to cause the most excruciating suffering, and this, perhaps, even when there is no inflammatory redness, ulceration, or appreciable disease of any kind.

Neuralgia of the rectum must be treated according to the nature of its exciting cause, which should, therefore, always, if possible, be sought out, and removed. Thus, if there be hemorrhoids, stricture, or ulceration, no decided impression can be made upon the case until these affections are disposed of. As there is almost always manifest derangement of the digestive organs, either as a cause or an effect of the malady, a mild, but systematic, course of purgation constitutes, in general, a primary object in the treatment. On no account should the rectum be allowed to become distended with fecal matter, as this may, of itself, be sufficient to bring on and keep up neuralgia of this tube in its most violent forms. After due attention has been bestowed upon the secretions of the stomach, liver, and bowels, the most appropriate remedies will be quinine, iron, arsenic, and strychnia, in quantities suited to the age, habits, and temperament of the individual. When the paroxysms observe a regular periodicity, the quinine should be given in large doses, as ten grains, combined with one-third of a grain of morphia, every six, nine, or twelve hours, until the disease is broken up. During the attacks, anodyne enemata, suppositories, and fomentations will be beneficial. Despite, however, all these and other means, the malady often continues, with little mitigation, for years, baffling the skill of the practitioner, and compelling the patient to eke out a miserable existence.

PRURITUS OF THE ANUS AND NATES.

The skin at and immediately around the anus is liable to be the seat of pruritus, or a peculiar form of itching, frequently as obstinate as it is annoying. The affection is most common in middle-aged and elderly subjects, particularly such as are of a weakly constitution, or inclined to dyspepsia and irregularity of the bowels. I have, however, repeatedly witnessed it in persons apparently in the most perfect health. Occasionally it occurs during pregnancy, coming on soon after conception, and going off gradually after delivery. Women who have recently ceased to menstruate are also liable to it. Persons of a light, delicate skin, florid complexion, and red hair, are particularly prone to the complaint; but from what I have seen of it, I am inclined to believe that no physical organization, temperament, or occupation is entirely exempt from it.

The disease consists essentially in an eczematous condition of the skin, which is covered with exceedingly minute vesicles, scarcely as large as the smallest pin head, and occupied by a thin, watery fluid. When these vesicles break, they leave little sores, discharging an irritating sanies, which, as it dries, sometimes forms little incrustations upon the surface. Instead of vesicles, small cracks or chaps occasionally appear upon the skin around the anus, similar to those so often met with on the lips and nose. The affected surface is generally very limited, perhaps not exceeding in size a quarter of a dollar. From the constant rubbing to which it is subjected, it is liable, in time, to become indurated, stiff, thickened, and furrowed; from the same cause, or even from the mere friction of the buttocks in locomotion, it is apt to become inflamed and painful, producing difficulty in walking, riding, and even in sitting. I have known the pain thus occasioned to extend down along the corresponding limb as far nearly as the heel. In bad cases, the disease may spread over a considerable surface, attacking, perhaps, at the same time, the buttock, the perineum, the scrotum, and even the thigh. More remote parts, too, may suffer, as the face, neck, nose, and eyelids.

The duration of the pruritus is extremely variable, lasting sometimes only a few days or weeks, and at other times as many months. Once fairly rooted, it may persist, despite our remedies, for an indefinite period. In one case I knew it to continue, with an occasional intermission, for sixteen years, and in another for upwards of twenty, before it finally disappeared. It is commonly worse in cold than in warm weather, and at night than in the day. At night, indeed, it is often so severe as to prevent sleep for hours together, or if the patient is so fortunate as to sink off into a doze, he soon wakes himself up by scratching and rubbing the part. Sometimes the disease unexpectedly disappears, the person imagining himself well, when, all of a sudden, either without any obvious cause, or from the slightest irregularity of diet, fatigue, loss of rest, or exposure to heat, it returns with all its former severity.

The cause of pruritus is often difficult of detection. The complaint is unquestionably, in many cases, associated with disorder of the anus or ano-rectal region, as hemorrhoids, stricture, sacciform disease, and the presence of ascarides; but whether it is produced by it is a point which has not been determined. We certainly see cases every day of these affections without the occurrence of pruritus. In most of the instances of the latter complaint that have come under my observation I have been disposed to ascribe its origin to some derangement of the digestive apparatus, as dyspepsia and constipation, attended with an irritable state of the constitution, and to regard it as a kind of safety-valve, designed to protect other and more important parts from disease.

In the *treatment* of this affection, a primary object should be to inquire into the condition of the anus and digestive organs, with a view to the rectification of any disorder that may be supposed to be capable of exerting an influence in producing and perpetuating it. If the general health is impaired, no improvement will be likely to take place in the local disease until this has been restored. In some cases tonics, as iron and quinine, may be demanded, while in others directly opposite measures may be indicated, depending upon the state of the system. In almost every instance, a regular systematic course of purgatives, consisting of blue mass or the compound calomel pill, along with iodide of potassium, or, in plethoric subjects, the antimonial and saline mixture, in small doses, will be serviceable. The diet must be bland and unirritant. The most useful topical remedies are the yellow wash, solutions of acetate of lead and laudanum, lotions of permanganate of potassa, Turner's cerate, tar ointment, and citrine ointment, all properly diluted. Cold ablutions with castile soap afford great relief, and are indispensable to the patient's comfort. In obstinate cases, resisting the ordinary remedies, slight ptyalism, maintained for several weeks, should be tried.

MALFORMATIONS.

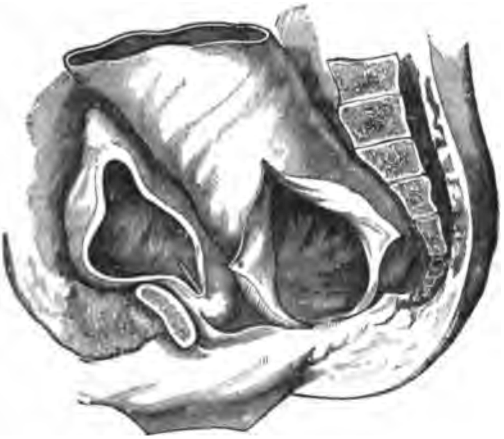
The anus and rectum are liable to malformations, of which the most important are, an imperforate state of the former, and the termination of the latter in a cul-de-sac, or its communication with the urethra, the bladder, or the vagina. Examples have been observed, although very rarely, in which the rectum opened in the sacral region, at the umbilicus, on the side just below the scapula, and on the face, the congenital vice having, in each instance, been conjoined with other aberrations of structure. In another class of cases, also exceedingly uncommon, it terminates in the perineum, in a canal common to it and to the genito-urinary organs, constituting thus a species of cloaca, similar to that of a bird. On the other hand, the rectum and anus being perfectly natural, the former may receive the ureters, or even the vagina, and thus conduct off both the urine and the menstrual fluid. Such malformations are obviously more interesting in a physiologico-pathological point of view than in a surgical one, inasmuch as they are always necessarily irremediable.

The most simple, as well as most frequent, variety of imperforate *anus*, is where the occlusion is effected by a continuation of the common integuments, or a cutaneo-mucous lamina, from one side to the other, the junction being established imperceptibly at the median line. The covering thus formed is generally so thin and translucent as to permit the meconium to be distinguished through it, and to bulge out whenever the child makes an effort at defecation, the tumor receding under the finger, but immediately reappearing when the pressure is removed. More rarely the closure is established by a cellulo-fibrous structure, from one to three lines in depth, dense, hard, and inelastic, and accompanied by more or less contraction and puckering of the circumjacent parts. In either case, but especially in the latter, there is usually an imperfect development of the sphincter muscles; and hence, although the defect may be remedied by operation, the child cannot, for a long time, exercise much control over its alvine evacuations. Sometimes, again, an anus exists, but only in a rudimentary state, being so small and tight as to afford a very inadequate outlet for the contents of the bowels.

When the anus is closed by a covering of the common skin, a crucial incision will generally suffice to afford relief, the angles of the wound being snipped off, and the skin and mucous membrane tacked together by several points of suture. In the second form of the occlusion, the structures must be divided more thoroughly, readhesion being prevented by the tent, and the requisite size imparted by the daily use of the bougie. When the anus is merely contracted, the frequent insertion of the mother's finger will be the best instrument for dilating it; this failing, the margins are notched on each side with a probe-pointed bistoury.

Occlusion of the *rectum* may be caused either by a species of hymen, situated from six to twelve lines above the anus, or by a cellulo-fibrous substance, of variable length and thickness. In the former case there is always a well-formed anus, whereas in the latter the anus is either completely wanting, or present only in a rudimentary state. The ano-rectal septum, as it may be termed, is composed of a fold of mucous membrane, of a circular shape, and is always easily detected with the probe or finger. During the cries of the child, and especially during straining, in attempts at defecation, it is sometimes forced down almost within reach of the eye, forming a dusky, fluctuating protrusion. In the second variety of occlusion, of which fig. 435, from Ashton, affords a graphic illustration, the obstruction is caused by cellulo-fibrous matter, which often extends to the height of an inch and even an inch and a half, constituting thus a most formidable barrier. Finally, the rectum is sometimes entirely absent, the intestinal tube terminating in a cul-de-sac, or opening, as previously stated, at some unnatural point. However this may be, the pelvis is generally abnormally small, and there is no trace whatever of an anus. In rare cases, the absent canal is represented by a fibro-ligamentous cord, attached to the colon, and descending along the sacrum towards the neck of the bladder, where it is lost in the cellular substance.

Fig. 435.



Imperforate rectum and anus.

The most simple form of occlusion of the rectum admits of relief by a very easy procedure, consisting in a crucial division of the septum, with or without removal of the angles of the wound, and the occasional introduction of the mother's finger, which is, in all such cases, the best tent. In the other variety, a severe operation is required, and that, too, in many cases, without any certainty of ultimate success. The child being held upon the lap of an assistant, the breech is exposed as in lithotomy, and an incision made through the posterior part of the raphé of the perineum, the knife being carried up in the direction of the curve of the sacrum to the distance, if necessary, of two to three inches, the left index-finger serving as a guide to the instrument. The operation is done slowly and cautiously, care being taken to avoid the bladder and urethra in front, the great pelvic vessels at the sides, and the sacrum posteriorly, lest, as it respects the latter, the knife pass behind the tube of which it is in search. Patency and dilatation are promoted by tents and bougies, cautiously used for a long time afterwards, and aided, if requisite, by an occasional touch of the bistoury, to counteract the tendency to closure, which is always great in such cases.

An operation similar to the one just described may be performed when the rectum is absent, although with hardly any possibility of a successful issue; for, even supposing that the canal could be reached, the child would be likely to perish from peritoneal inflammation, induced either by the incision of the intestine, or by the extravasation of fecal matter. Still, it is justifiable because there is no other chance of relief, except by the establishment of an antificial anus in the lumbar region; a procedure not only fraught with danger, but, in all respects, so undesirable as hardly to be thought of by any right thinking surgeon, for life, in such a condition, would certainly not be worth having.

The rectum, instead of terminating at the anus, occasionally, though very rarely, opens by a narrow canal into the *urinary* passages, generally at the posterior part of the urethra, or at the bas-fond of the bladder, a short distance below the insertion of the ureter; the former mode of communication being the more frequent. The malformation is almost peculiar to males, and generally proves fatal within a few days after birth, on account of the small size of the recto-vesical outlet not allowing of a sufficiently free discharge of fecal matter. To this rule, however, occasionally an exception occurs. Thus, in a case which I attended with Dr. Kempf, and in which I made a very deep incision without reaching the bowel, the child survived six weeks, passing daily a little fecal matter by the urethra. An uncle of the child had lived in a similar condition for upwards of thirty years. Such a vice of formation is generally beyond the surgeon's skill; still, when the danger is imminent, an attempt should be made to reach the bowel by cutting along the sacrum, a staff being inserted, if possible, into the recto-vesical orifice as a guide to the instrument.

When the rectum terminates in the *vagina*, the opening is usually situated low down, and is a good deal larger than when the bowel communicates with the urinary passages, though seldom equal to nature's wants. On this account, and also for the purpose of freeing the vagina, an attempt should be made to establish an opening at the usual site of the anus. The operation is very simple, the knife being carried from before backwards, in the direction of the raphé of the perineum. The skin and mucous membrane may afterwards be tacked together, and reclosure prevented by the finger and bougie. The fissure in the vagina may be obliterated, at a subsequent period, by several points of suture.

CHAPTER XVI.

INJURIES AND DISEASES OF THE ABDOMINAL ORGANS.

SECT. I.—WOUNDS OF THE STOMACH.

WOUNDS of the stomach are characterized by excessive pain in the epigastric region, nausea, extreme prostration, and vomiting of blood, either pure or mixed with bile, mucus, or ingesta. The site of the external wound will often throw important light upon the diagnosis. The great danger is from effusion of the contents of the stomach, causing peritonitis. If the opening is small, situated at the lesser curvature of the organ, and inflicted during the empty state of the stomach, restoration may take place by the first intention; in general, however, such a result is not to be looked for, and in most cases death occurs, as in similar lesions of the intestines, in from thirty-six to forty-eight hours, from inflammation. Occasionally the patient dies from shock. Wounds of the stomach are often complicated with copious hemorrhage, and with injury of the diaphragm, lungs, bowels, and other viscera. In some instances the patient escapes with a fistulous opening in the epigastric region, as in the celebrated case of Alexis St. Martin, so well described by Dr. Beaumont.

Wounds of the stomach must be closed by suture, and afterwards managed with special reference to the prevention of undue inflammation. For the first few days nothing should be taken but mashed ice, in quantities barely sufficient to allay thirst and to quiet gastric irritability, with occasionally a little arrowroot, tapioca, or sago. Where gastrorraphy has been neglected, or rendered impracticable, it is best to withhold everything by the mouth until the edges of the wound have contracted adhesions to the adjacent parts, and to place our main reliance, as it respects the comfort and support of the patient, upon the application of ice to the epigastrium and the use of nourishing enemata. Laxatives are, of course, out of the question. Constipation and flatulence are relieved by injections; pain and vomiting, by morphia.

As wounds of the stomach are comparatively rare, I subjoin the following cases in illustration of the subject.

A man, aged thirty-five, received a deep cut in the lower part of the epigastric region, penetrating the stomach along its anterior surface for a distance of nearly three inches. The injury was inflicted with a large knife, a few minutes after a full supper. I saw him in less than a quarter of an hour after the accident; he was pale and exhausted from the loss of blood, extremely restless, very thirsty, and constantly inclined to vomit. His abdomen was covered with ingesta, which had escaped through an opening in its walls large enough to admit the fist. Sinapisms were applied to the extremities, and turpentine was thrown into the rectum, to favor reaction; but he grew weaker and weaker, and died in less than two hours after I reached him. The dissection disclosed a large quantity of coagulated blood in the peritoneal cavity, from the division of the branches of the gastric artery, and a considerable extravasation of undigested food mixed with the blood. The edges of the wound in the stomach were much everted, thereby sensibly diminishing its orifice.

A young man was stabbed with a knife in the left side, between the eighth and ninth ribs, about midway between the spine and sternum, the wound being about one inch long. It was occupied by a piece of omentum, but a finger, passed into it, readily entered the cavity of the abdomen. A number of imperfectly masticated beans and other substances lay on the surface of the abdomen, leaving no doubt, especially as there had been no vomiting, that the stomach was wounded. The patient suffered much pain; he was pale, and the pulse was considerably accelerated, but not deficient in force. Dr. Raphael, who saw him soon after the accident, contented himself with closing the outer wound with adhesive plaster, supported by a compress and bandage. An anodyne was administered, and perfect quietude enjoined.

Excessive thirst and restlessness soon set in, followed by vomiting, in which the patient threw up a small quantity of blood. The breathing, after some time, also became painful and difficult. To afford greater play to the diaphragm, the compress and bandage were removed. About half a pint of dark-colored fluid escaped from the wound, with evident relief of the unpleasant symptom. The pulse, however, gradually sunk, and the man expired sixteen hours after he was stabbed.

On dissection the deep portion of the wound was found to be upwards of two inches in length, the instrument having glided obliquely along the intercostal space between the eighth and ninth ribs, towards the sternum, and made an opening in the cordiform tendon of the diaphragm, sufficiently large for the passage of the entire stomach, along with a part of the colon and omentum, into the left thoracic cavity. The stomach was perforated at the great cul-de-sac by an opening nine lines in length, and situated four inches from the œsophageal extremity, the mucous membrane being everted, and of a deep red color. It contained about half a pint of ingesta. The left lung was completely collapsed, and of a bluish, macerated appearance. The corresponding cavity contained about a pint of bloody fluid, composed, in great measure, of the contents of the stomach, intermixed with beans and other substances. A small quantity of bloody serum lay among the convolutions of the intestines and in the pelvis. The peritoneum was sound.

A man, aged thirty-six, was stabbed in the abdomen, at 7 o'clock in the evening, with a large knife, which, passing in a horizontal direction, made an incision nearly six inches in length. The wound commenced a short distance from the umbilicus, at the right side of the middle line, and terminated in the left hypochondriac region. When I reached the patient, a few minutes after the accident, the whole of the small bowels, and the right portion of the arch of the colon, together with the omentum, were lying upon the belly, covered with blood, partly fluid, partly coagulated. The pyloric extremity of the stomach also protruded, and was laid open, at its anterior surface, to the extent of an inch and a half. The orifice was occupied by ingesta, and the mucous membrane was everted. There was also a small wound in the prolapsed colon and omentum, from which the blood covering the bowels appeared to have proceeded. The man was deadly pale, nauseated, and in violent pain. The pulse was feeble and frequent, and the surface covered with cold perspiration. Altogether, the case presented a frightful aspect.

Five sutures, after Lembert's method, closed the wound in the stomach very accurately, and six interrupted sutures that in the abdomen. As the deep portion of the outer wound was much retracted, I experienced great difficulty in effecting the desired apposition. The stitches were, therefore, passed through the muscles, close to the peritoneum. A thick compress and broad bandage completed the dressings. The knees and shoulders were elevated, to relax the abdominal muscles. A grain of morphia was given immediately, and another grain during the night, as the pain was excessive. Intense thirst and restlessness succeeded, and continued uninterruptedly until 4 o'clock the next morning, when the man expired in a state of complete exhaustion. A considerable quantity of blood was found in the belly, but no peritoneal inflammation.

It is not impossible that a severe contusion of the stomach from a fall or blow may lead to fatal results by inducing peritonitis. Rupture of the organ from accidents of this kind is rare. The effects of a severe blow upon the stomach are sometimes promptly fatal. Some years ago, a colored man was struck violently upon the epigastrium by one of his companions, and instantly expired. The records of surgery abound in similar examples. No perceptible lesion is generally discoverable in such cases on dissection.

SECT. II.—WOUNDS OF THE INTESTINES.

Wounds of the intestines are of three kinds, incised, lacerated, and punctured, including under the latter denomination all lesions from fire-arms and pointed weapons, as dirks, sabres, bayonets, and swords. In whatever manner, however, they may be inflicted, they are all characterized by similar symptoms, and require a similar mode of treatment. Hence, the description of one will, with little variation, suffice for the rest.

All parts of the intestinal tube are liable to these lesions, though not in an equal degree. The ileum and the jejunum, owing to their great length, their floating condition, and the large space over which they are spread in the abdomen, are peculiarly prone to suffer; while the duodenum and the large bowel, especially the rectum, are rarely affected. The intestine alone may be injured, or the same blow which wounds the intestine may pierce the omentum, the spleen, liver, or other organs. Sometimes an important bloodvessel is laid open, thus complicating the case with hemorrhage. When the lesion is inflicted with a ball, both the small and large bowel are often involved, as I have seen in several of my own cases. The same circumstance not unfrequently happens in wounds made with knives, dirks, and other sharp-pointed weapons. Again, the tube may be merely pierced by the vulnerating body, or it may be completely transfixed, either on the same level, or at different heights. In 1854, I attended a man, along with Dr. Cummings, in whom a pistol ball, entering a short distance below the navel, a little to the left of the middle line, completely perforated, in its upward and outward passage, the ileum, jejunum, duodenum, and arch of the colon, making thus eight separate orifices. Finally, instances occur in which the bowel is torn completely across, as when the injury is inflicted by a severe fall, or the kick of a horse.

Wounds of the intestines are of various forms. In general, they are oblique, but occasionally transverse, or even longitudinal. Gunshot wounds are usually somewhat circular. In their dimensions, these lesions vary from the smallest puncture to an opening several inches in length.

Symptoms.—The symptoms of these injuries are local and constitutional. Both, unfortunately, are too often equivocal, especially within the first few hours after the receipt of the wound, when there is no protrusion of the bowel, or when the opening in the wall of the abdomen is so small, so situated, or so shaped as to oppose an effectual barrier to the escape of the contents of the tube. When the intestine hangs out at the external wound, the nature and extent of the mischief are at once apparent. The lesion then admits of demonstration. But it is very different when the bowel is retained in the belly. In such an event, the most important sign is an escape of feces, bile, mucus, ingesta, or fetid air at the opening in the wall of the abdomen. As these substances can proceed only from the alimentary canal, the stomach, or the gall-bladder, their presence is characteristic.

Another symptom, also of great value, especially when there is no protrusion of the bowel, is the sudden development of tympanitis, not in the alimentary tube, but in the general peritoneal cavity. This phenomenon is often present when the others are absent, and is, therefore, of immense diagnostic consequence. It supervenes at various periods, from a few minutes to a number of hours, after the occurrence of the accident, and is always accompanied with a hollow, drum-like sound on percussion, with tenderness on pressure, and difficulty of respiration. Its development is generally very gradual, and sometimes it is so slow as hardly to attract any attention for more than a day. Occasionally it attains such an enormous height as to encroach seriously upon the diaphragm and abdominal viscera. I have seen cases where the tympanites was distinctly circumscribed or limited to particular regions of the abdomen. It is probable that, under such circumstances, the air is prevented from diffusing itself by the formation of adhesions consequent upon the inflammatory process. In fatal cases, the fluid always remains undiminished; but when recovery takes place, it is gradually absorbed, and ultimately, though, perhaps, not under several weeks, entirely disappears. It is commonly of a fetid character, and, on opening the abdomen, often escapes with an explosive noise.

Tympanites, however, does not attend all traumatic injuries of the intestinal canal. When the opening is very diminutive, amounting rather to a puncture than a wound, properly so called, the escape of gas will either be entirely prevented, or it will occur only in a small degree, owing to the protrusion of the mucous membrane across the aperture, which, acting like a valve, thus effectually opposes the egress of feces, mucus, and even air.

Sometimes, though rarely, the flatus escapes from the wounded bowel into the subperitoneal cellular tissue, and thence among the muscular and subcutaneous structures of the wall of the abdomen, where, diffusing itself more or less extensively, it forms a puffy, crepitating swelling, easily distinguishable by the sight and touch. The value of such an occurrence, diagnostically considered, is sufficiently apparent. Care, however, must be taken not to confound it with the emphysema of incipient gangrene or putrefaction of the part, or an escape of air into the cellular tissue of the chest, from a penetrating wound of the pleura and lung.

A discharge of blood from the anus is another symptom, which, in connection with some of those just mentioned, is of considerable importance in the discrimination of this lesion. Still, as it often attends other affections, it cannot be regarded as at all characteristic. The quantity of blood evacuated amounts occasionally to many ounces. In several instances I have seen from a quart to half a gallon voided in the course of a few days.

I have never noticed vomiting of blood in wounds of the bowel, though such an occurrence is not impossible when the injury is seated in the upper portion

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The constitutional symptoms of a wound of the bowel are generally such as denote a severe shock of the nervous system; but as they are common to this and other injuries, they are of little value in a discriminative point of view. Ordinarily there is nausea, either alone or accompanied with vomiting; the patient feels faint, his countenance is pallid, and his pulse is small and tremulous. These symptoms usually make their appearance immediately after the infliction of the wound, and often continue with great obstinacy for several successive days, or, in fatal cases, even up to the moment of dissolution. They are generally more violent and distressing in injuries of the small than of the large bowel, owing, as is supposed, to the more delicate organization of the former than of the latter, and to its more intimate connection with the stomach and the sympathetic nerves. The prostration of the vital powers is not always in proportion to the extent of the wound, or the actual danger of the case. Some persons suffer much more severely from a slight than others do from a violent injury, for reasons which cannot always be explained, but which may, usually, be presumed to be dependent upon some constitutional peculiarity. Reaction occurs at various periods; sometimes soon, at other times not under many hours. Until it is fully established, there is occasionally a remarkable tendency to syncope, with an alarmed and agitated state of the mind, which hardly anything can calm or subdue. The countenance, in this event, has a pale, anxious, haggard expression; the pulse is small, frequent, and tremulous; the surface is bathed with clammy perspiration; the extremities are cold; the breathing is embarrassed, and there is frequent sighing, with excessive restlessness; the desire for cold air and drink is urgent; griping pains are complained of; and occasionally there are involuntary discharges from the bowels.

Diagnosis.—In the diagnosis of a wounded bowel important information may frequently be obtained, in regard to the direction, extent, and depth of the lesion, by a careful consideration of the size and shape of the vulnerating body, and the relative position of the parties at the time of the accident. Whenever, therefore, the means are at hand for such an investigation, the opportunity should not be neglected. If the opening in the wall of the abdomen is large, the best instrument for ascertaining its condition is the index-finger, or a grooved director; with either of these, it is generally easy to determine whether the wound involves the muscles only, or the muscles and the peritoneal cavity. The pocket probe is not well adapted to such an examination, as it is liable, from its small size, to have its point arrested among the tissues. Whatever instrument is employed, all officious interference must be avoided, as likely to do harm instead of good. In exploring the wound, it is important that the part and body should be placed as nearly as possible in the position in which they were at the moment of the accident. When the injured bowel protrudes at the external opening, the diagnosis is at once obvious, as the nature and extent of the lesion may be determined by simple inspection. The lesion, in the absence of pathognomonic symptoms, ought to be suspected when nausea and vomiting occur after a penetrating wound of the abdomen, accompanied with griping pains, great debility and faintness, jactitation, extreme anxiety, and cold sweats. The case is plain enough when there is a discharge of the contents of the alimentary tube, or a sudden developmpanites, gradually increasing, and attended with decided tenderness domen.

an interesting fact, in relation to the present inquiry, that, although an ument may pierce the peritoneal cavity, it need not necessarily wound the wels, or, indeed, any other important organs. Nay, further, it may not only ay open this cavity, but completely traverse it, or even emerge at the opposite side, and yet inflict no serious mischief upon the contents of the abdomen. Instances like the latter are certainly uncommon, but that they do occasionally occur is abundantly proved by the concurrent testimony of military and civil practitioners.

Numerous examples of penetrating gunshot wounds of the abdomen are recorded, in which the bowels did not appear to have suffered the least injury, and where recovery followed under the most simple treatment. A case observed by Dr. J. W. Richardson, of Tennessee, was evidently of this nature. The ball, weighing two drachms and a half, entered the belly at the right side of the middle line, and issued midway between the last rib and the sacro-iliac symphysis, just to the right of the spine. There was no escape of gas, mucus, feces, or ingesta at either opening; a little bloody urine, however, was voided soon after the accident, and for more than a week there was some tension, with considerable soreness and swelling of the abdomen. The patient was perfectly well in less than a month.

Hemorrhage.—Wounds of the bowels are occasionally complicated with hemorrhage of the peritoneal cavity, from lesion of the vessels of the abdomen. A considerable quantity of blood sometimes flows back into this cavity from an opening in the epigastric artery; but most generally the bleeding proceeds from injury of the omentum, the mesentery, or some other structure, accidentally divided along with the intestine. In rare instances the hemorrhage is derived from the aorta or vena cava. However this may be, unless the abdominal wound is large, very little, if any blood, will appear externally, so as to disclose the real state of the case; instead of this, it will pass back into the serous cavity, lodging in the folds of the bowels, descending into the pelvis, or diffusing itself extensively among the viscera. The amount and rapidity of the effusion will vary in proportion to the size of the wound and the volume of the vessel concerned. When the vessel is very large, and the opening considerable, the hemorrhage may be instantly fatal, or death may ensue in a few hours from the accident. In cases of an opposite character, the symptoms will be less urgent, and the patient will probably suffer no particular inconvenience, save what results from his temporary debility. The blood will soon coagulate, and, pressing upon the orifice of the bleeding vessel, will thus oppose an effectual barrier to further effusion.

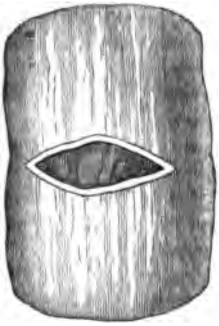
The existence of internal hemorrhage, as a complication of a wound of the bowel, is denoted by excessive pallor of the countenance, a small, tremulous state of the pulse, frequent sighing, clammy sweats, coldness of the extremities, intense thirst, and constant jactitation.

Effects.—The speedy, if not immediate, effect of almost every wound of the bowel is the extravasation of a portion of its contents. It is upon this circumstance, mainly, that the great danger of an injury of this kind depends. Were it not for the escape of fecal matter, and the contact of this matter with the peritoneum, the mortality from wounds of the intestines would, probably, be comparatively slight. It seems, until very recently, to have been an axiom with surgeons, that there is, properly speaking, no peritoneal cavity, and hence that, in perforation of the bowel, there can be no fecal effusion. Now, such a conclusion as this is not only wholly gratuitous, but calculated to be exceedingly injurious in a practical point of view, from the fact that it must necessarily lead to erroneous principles of treatment. That there is a nice adaptation among the abdominal viscera to each other, and of these viscera to the walls by which they are inclosed, is unquestionable; but that they are so closely and equally pressed together as to afford no space for the lodgment of extraneous matter is certainly not true. So far, indeed, from this being the case, it may be assumed that, if there is no extravasation of fecal substance, after a wound of the bowel, it is because there is no substance of the kind present. The absence, then, of such an occurrence is, in all injuries involving the continuity of the alimentary tube, the exception to a great and important law, not the law itself, as was at one time supposed.

That the extravasation of fecal matter is influenced by the nature and extent of the wound, I ascertained long ago by experiments upon the inferior animals, as well as by observations on the human subject. I found, for example, in dogs, that, when the opening is six lines in extent, whether transverse, oblique, or longitudinal, there is almost invariably an escape of fecal matter, speedily followed by fatal peritonitis. If, however, the wound, whatever be its direction, does not exceed four lines in length, or a third of an inch, such a contingency will not only be less likely to happen, but in many cases, if not in a majority, nature, aided by appropriate therapeutic measures, will be fully competent to effect reparation.

The safety of the patient, in comparatively small wounds of the bowels, no doubt frequently depends upon the diminution which the opening instantly experiences after their infliction, from the contraction of the muscular fibres of the tube, and the eversion of its mucous membrane, as seen in fig. 436. The following experiments bear directly upon this point:—1. A longitudinal incision, two lines and a half in length, immediately contracted to one line and three-quarters, with a sufficient degree of eversion of the lining membrane to close the resulting orifice. 2. A similar wound, four lines long, diminished in a few seconds to three lines, by one line and a half in width; it assumed an oval shape, and the mucous tunic protruded on a level with the peritoneal surface, leaving no perceptible aperture. 3. An oblique cut, seven lines in length, contracted to five, by two and a half in width, with marked eversion of the lining membrane. 4. A transverse wound, two lines and a half long, was reduced almost instantaneously to two lines in diameter; it was of a rounded form, and the two outer coats of the bowel retracted so as to expose the mucous tunic. 5. In this experiment, in which the incision, likewise transverse, was half an inch in extent, the orifice assumed a rounded, oval shape, and was reduced to four lines, by two and a half in width, the internal coat exhibiting, as in the other cases, a pouting or everted arrangement.

Fig. 436.



Wound of the intestine with eversion of its edges.

These observations are of the deepest interest, as showing the efforts which nature makes to close a breach of this kind, almost the very instant that it is inflicted. The eversion of the mucous membrane forms a constant and striking feature in all incised wounds of the bowel, whatever be their shape, extent, or direction, and may be compared, in its effects, to the contraction and retraction which take place in the extremities of a divided artery. As the latter are intended to prevent the effusion of blood, so the former is intended to prevent the effusion of fecal matter. Both are wise provisions of nature, designed to protect the patient's life.

In gunshot wounds of the bowels, and in incised wounds attended with severe contusion, the eversion of the mucous coat is generally very slight, and sometimes even absent. Owing to this circumstance, wounds of this description, even when very small, are extremely prone to be followed by fecal extravasation and fatal peritonitis.

When the contents of the bowel are effused over the peritoneum, the inevitable effect is death from inflammation. The period at which this occurs rarely exceeds sixty hours; sometimes, indeed, it takes place even considerably earlier. In a remarkable case of pistol wound, in a man, aged twenty-two, under my observation in 1854, life was preserved for six days, under circumstances, apparently, of the most desperate character. The ball, entering the abdomen, about two inches below the navel, a little to the left of the middle line, ranged obliquely upwards and backwards, towards the right hypochondriac region, completely perforating the ileum, jejunum, and duodenum, together with the arch of the colon, thus making eight distinct openings. Fecal matter escaped at the external wound soon after the accident, but not subsequently. The man was shot on a Sunday evening, and lived until nearly the same hour on the following Saturday, having suffered but little pain, and dying completely exhausted. The bowels were confined during the entire period, and, what is remarkable, there was very little tympanites. The ball could not be found on the dissection. No important vessels had been injured. The peritoneum was everywhere much inflamed, and its cavity contained at least half a gallon of very fetid serous fluid, intermixed with fecal matter. The bowels were extensively adherent both to each other and to the walls of the abdomen. The openings made by the ball had an irregular, ragged aspect, and were surrounded by a considerable quantity of plastic matter.

The extravasation of fecal matter generally produces inflammation of the peritoneum within a very short time, probably within less than an hour, after its occurrence. The disease, once begun, progresses with great rapidity, and often extends over nearly the whole surface of the membrane. The symptoms, denotive of its presence, are, violent burning pain of the abdomen, with exquisite tenderness on pressure, and retraction of the thighs; constipation of the bowels; a sharp, frequent, and contracted state of the pulse; intense thirst; constant wakefulness; excessive restlessness; great anxiety; and coldness of the extremities. In the latter stages there is generally some degree of nausea, with occasional vomiting; the pulse is weak and fluttering; the surface is bathed with a cold, clammy sweat; the features are collapsed; the breathing is oppressed and laborious; the belly is extremely tense and tumid; the strength rapidly declines; and, finally, the patient dies under all the symptoms of one sinking from the effects of mortification. The attack, as previously stated, rarely continues beyond two days and a half, and often terminates in a much shorter period. The appearances after death are always well marked, even when the disease has not been protracted. The peritoneal surface is highly inflamed, the bowels are covered with lymph, and the abdominal cavity usually contains a small quantity of turbid serum. Occasionally a considerable amount of pure blood, or blood mixed with lymph and other substances, is present. At the seat of the wound, and frequently also at other points, fecal matter, or other evidence of intestinal effusion, is found. The edges of the opening are usually somewhat everted, and adherent to the surrounding parts, which are always extremely red and inflamed. Extensive adhesion generally exists between the bowels, as well as between the bowels and other structures; and, on penetrating the belly, there is almost invariably a free escape of fetid gas.

Prognosis.—The danger of wounds of the intestines must necessarily be influenced by a great variety of circumstances, such, particularly, as the extent of the mischief, the nature of the vulnerating body, and the state of the patient's health at the time of the accident. A small and simple lesion will be much more likely to turn out favorably than one involving a large surface, or one complicated with injury of some other organ, or the perforation of a large vessel. The danger is also less serious in an incised than in a contused or lacerated wound, and in a superficial than a deep one. Persons occasionally perish from the most trivial accidents of this kind, from mere shock, apparently, of the nervous system; they lie in a pale and exhausted condition, and death takes place unpreceded by reaction. On the other hand, recovery sometimes occurs under circumstances seemingly the most desperate and unpromising. No certain rule can, therefore, be laid down in respect to the prognosis of wounds of this description, which, however, must always be considered as severe accidents, liable, in a great majority of cases, to be followed by the worst consequences.

Wounds of the large bowel were regarded by the older surgeons as generally less dangerous than those of the small; a view in which I am inclined to concur, though the rule is not without many exceptions. The reason of this difference is, first, the more fixed condition of the large bowel; secondly, its more capacious caliber; and, thirdly, the more solid nature of its contents. All these circumstances, especially the first and last, are supposed, and not without reason, to be favorable to the prevention of fecal extravasation, the great danger in all injuries of this kind. Extravasation will also be less likely to happen if the bowel be empty at the time of the accident than if it be distended. The fecal matter, if very small, is sometimes limited by plasma, and its discharge ultimately promoted by the formation of an abscess; or chronic action is established in the serous membrane, and the patient, after weeks or months of suffering, sinks under the exhausting influence of the malady.

A case has been communicated to me by Dr. C. S. Bishop of gunshot wound of the colon, followed by complete recovery, the man having been able to rejoin his regiment in two months and a half after he was shot. The ball had entered the abdomen a little to the left of the umbilicus, and emerged on the same side behind, near the anterior edge of the square muscle of the loin, on a level with the crest of the ilium. The slough separated on the twelfth day, and soon after this the wound began to discharge feculent matter, which continued, at times quite profusely, for a fortnight, when it entirely ceased.

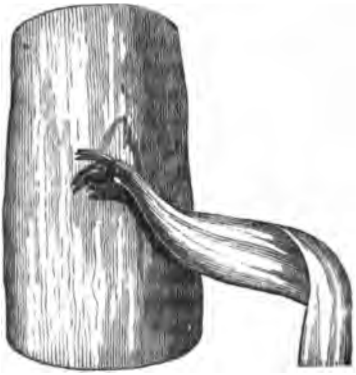
Mode of Repair.—Wounds and punctures of the bowel, unaccompanied by an effusion of fecal matter, heal, if left to themselves, either by the adhesion of their edges to the surrounding parts, or by a deposit of lymph upon their surface, and the gradual approximation of their lips. In the majority of cases, it is probable that the repair is effected in the former manner, inasmuch as there is always a great tendency in the injured structures to attach themselves to those in their immediate vicinity. Even wounds of large size are occasionally cured in this way. In some instances, again, the breach is closed by a piece of omentum, which, projecting into it, fills it up like a tampon. When this occurs, the contiguous serous surfaces become firmly adherent to each other, and that portion of the plug which lies within the bowel, and assists in maintaining its continuity, is eventually absorbed; a circumstance which leads to the gradual approximation of the lips of the wound, and their ultimate reunion.

This extraordinary disposition to adhesion in the external surface and edges of these wounds to the parts around them is nothing more than what might be expected when we reflect upon the structure of the peritoneum, and its invariable tendency, when inflamed, to pour out plastic matter. But it is otherwise with the mucous membrane. Here the process of reunion is not only much slower, but much less perfect; lymph is supplied very sparingly, or in quantities barely sufficient to fill up the chasm between the margins of the wound, and, owing to the heterogeneous and irritating character of the contents of the tube, a long time must necessarily elapse before it can become an organized intermedium. The little band thus formed adheres firmly to the bottom of the breach, but very slightly, if at all, at least for some days, to its edges. Gradually, however, it becomes more and more dense; vessels extend into it; its margins are flattened down; and by and by, after a period varying from several weeks to as many months, the adhesion is complete. Subsequently, or, indeed, while these changes are still in progress, the new matter is nearly all absorbed, the wound sensibly diminishes in size, and, ultimately, nothing remains to show the seat of the original injury, save a little seam or depression in the wall of the bowel. The whole process may be compared to that which nature employs in repairing ordinary ulcers of the intestinal mucous membrane.

The above, however, is only one mode in which the restoration of the mucous surface is effected. Another, though by no means a frequent one, is by granulation. Such an event is always to be expected when the plastic matter is detached by the feces, or when its vitality is destroyed by the irritating contents of the bowel. Under such circumstances, nature makes an effort to repair the breach by the formation of granulations, as in similar injuries of other textures. The process, however, is usually much more tardy than in the former case, the cicatrization is also less complete, and the intestine at the seat of the wound is much more apt to be puckered.

When the wound is sewed up, the mode of repair is essentially the same, whatever may be its form. The inflammation which is lighted up induces an effusion of lymph, which is speedily followed by the adhesion of the injured coil to the neighboring structures, among which it is sometimes completely buried. At other times no such adhesion occurs, but the affected part throughout the entire line of suture is coated with a layer of plastic substance, by which the continuity of the serous membrane is finally re-established, and the threads used in sewing up the wound are concealed from view. In dogs there is, in a great majority of cases of this injury, an attachment of the omentum to the surface and edges of the wound, as seen in fig. 437, which thus remarkably assists in the process of restoration; but it is rarely, according to my experience, that we witness such an occurrence in the human subject, owing, perhaps, to the fact that the omentum is so much smaller in man than in the canine race of animals.

Fig. 437.



Wounded bowel with adherent omentum.

The manner in which the ligatures used in sewing up a bowel are detached varies, according to the mode in which they are applied. Both in the interrupted and the continued sutures, with their different modifications, the threads, provided their extremities are cut off close to the surface of the wound, always fall into the interior of the canal, along with the contents of which they are afterwards evacuated. The reverse is, of course, the case when the ends are brought out at the abdominal opening. The period at which the detachment of the ligatures occurs varies from eight or ten days to several weeks. In dogs, I have frequently found them still firmly adherent at the end of a month.

Effects similar to the above follow when a ligature is tied firmly round a bowel, or round the edges of a wound only a few lines in diameter. The cord gradually cuts its way through the different tunics of the tube, the continuity of which is re-established by a deposit of plastic matter upon the constricted part.

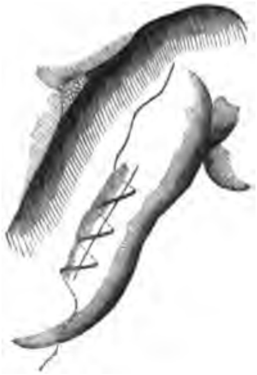
Gunshot wounds of the bowels are repaired in the same manner as incised. The plastic matter, effused as a consequence of the resulting inflammation, glues the injured surface firmly to the surrounding parts, so that by the time the bruised and lacerated edges of the opening slough off, as they frequently do after such accidents, there is no longer any risk of fecal extravasation. The wound afterwards gradually diminishes in diameter, and, the process of cicatrization being completed, the tube resumes its original appearance, with the exception of a slight contraction at the seat of the injury.

Treatment.—From what has been said, it is evident that the great danger in this class of injuries is from fecal effusion, so liable to occur even when the wound is comparatively insignificant. The proper treatment, therefore, to be pursued is simply to sew up the wound, and to replace the bowel as speedily as possible, watching the case most assiduously afterwards, with a view of preventing undue peritoneal inflammation; for whenever this obtains the ascendency, the patient must necessarily perish. It is folly to think of any other practice; the sheerest nonsense to talk about the irritating nature of intestinal sutures. Enterorraphy is, in itself, one of the most innocent of operations, and it is only surprising that it should ever have been regarded in any other light. What possible harm can result from depositing a little thread in the coats of an intestine, and retaining it there for ten or a dozen days? Some inflammation must, of course, arise, but this is precisely what is needed for the safety of the patient and the cure of the wound. Even if the wound is not more than a line and a half in length, the bowel ought not to be returned without stitching it. Fecal extravasation might occur, and the patient should, therefore, not be subjected to the risk of such a contingency. In several of my experiments death was produced, not by sewing up the bowel, or by the manipulation employed in performing the operation, but by the escape of fecal matter, along the large interspaces between the sutures, which thus allowed the wound to gap, and to favor the occurrence in question. Indeed, it may be laid down as an axiom, that, whenever the closure of the wound is incomplete, there is danger of intestinal effusion.

There are only two sutures which, in my opinion, are at all suitable for sewing up a wound of the intestines. These are the continued and the interrupted, with the modifications of the latter proposed by Lembert and Gely. All other expedients of this kind are complicated, uncertain, and, therefore, inapplicable. The continued and interrupted sutures are easily executed with a long, slender cambric needle, armed with a small, but strong and well waxed silk thread.

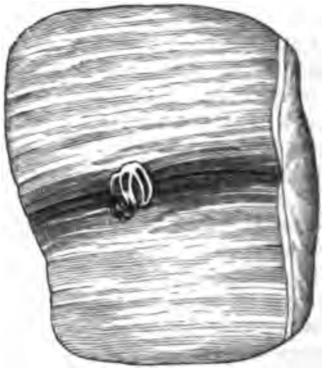
The *continued* suture, fig. 438, is made by passing the needle from one side of the wound to the other, across all the tunics of the bowel, except the mucous, in such a manner as to bring the serous edges in the most accurate apposition. Each stitch should not include more than half a line of substance, and the ends of the thread, being well secured at each angle of the opening, should be cut off close to the surface of the tube. In the interrupted suture, the needle is introduced in the same manner as in the continued, the ligatures being placed about two lines apart, but none being tied until all have been applied. The ends are then secured with a double knot, and cut off close. As the sutures become detached they gradually pass into the intestinal tube, into which they finally drop, to be discharged along with the fecal matter. In the adjoining sketch, fig. 439, the ligature is seen to be partially separated.

Fig. 438.



Continued suture.

Fig. 439.

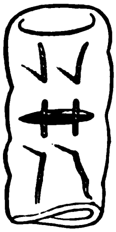


Ligature partially detached.

In *Lembert's modification*, which I have often performed successfully upon dogs, and which is illustrated in fig. 440, a short stitch, including only the peritoneal and muscular coats, is taken on one side of the wound, about two lines and a half from its edge; the needle is then carried across the gap, and a similar stitch is taken on the opposite side. In this way one thread after another is deposited, the intervals between them not exceeding the sixth of an inch; and when they are all arranged, they are drawn firmly together, and tied with a double knot, the ends being cut off as in the ordinary operation. By this procedure the wound is completely closed in every portion of its extent, its lips being inverted so as to approximate their serous surfaces, at the same time that they form a ridge, upwards of a line in length, within the tube.

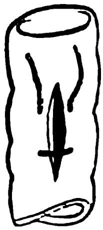
Gely's suture, which is merely a modification of that of Lembert, is made with two needles inserted near the angle of the wound, about one line from its edge; they are then carried along the interior of the bowel, parallel with the wound, for the sixth

Fig. 440.



Lembert's suture.

Fig. 441.



Gely's suture.

of an inch, when they are brought out precisely at the same level, so as to appear again on the peritoneal surface. The threads are then crossed, the right needle being passed through the puncture made by the left, and conversely, when the ends are firmly tied, and cut off close, as in the ordinary operation. The number of sutures varies, of course, according to the extent of the cut. In this way the edges of the wound are thoroughly inverted, and, consequently, all danger of fecal effusion is prevented; the coaptation, in fact, is so accurate as to conceal the ligatures. The annexed cut, fig. 441, conveys a correct idea of the manner of practising this suture.

In small wounds, of whatever direction, I give a decided preference to the ordinary interrupted suture. It is easy of execution, and, if proper care is taken in placing the stitches, the most perfect closure may be effected with it, even as it respects the serous edges of the wound. Of Lembert's modification of this method, I have also a favorable opinion, though it is more complicated, and more liable to be followed by undue contraction of the bowel at the seat of the injury. When the wound is of unusual length, the continued suture will be the most suitable, as it admits of easier application, and is attended with less risk of fecal extravasation. When the opening is a mere puncture, its edges may be included in a ligature, as is occasionally done in the operation for strangulated hernia.

The wound being effectually closed, the next step is the *reduction* of the bowel. This is always easy enough when there is a large external opening, but often very difficult when the opening is small. In the latter case, the bowel is sometimes so closely girted that it cannot be returned without dilating the wound in the wall of the abdomen. A small incision, however, with a probe-pointed bistoury, carried in the direction of the muscular fibres, will generally suffice for the purpose. Whenever any difficulty is apprehended, it will be well, before resorting to the knife, to relax the abdominal muscles. For this purpose the patient should lie upon his back, the head being supported by a large pillow, the pelvis elevated higher than the shoulders, and the lower extremities bent at the hips and knees. If the bladder is much distended, it should previously be emptied; and there should be no coughing, holding of the breath, or any exertion whatever calculated to impede the reduction. These arrangements being completed, the surgeon holds the bowel with his left hand, while with the right he pushes it gently back, beginning always with the portion that was protruded last, or that nearest the wound. These efforts are continued until the whole mass slips into the peritoneal cavity, when the external wound is closed by several points of the interrupted suture, carried down deeply through the muscular substance, and supported by a broad, thick compress and bandage, to prevent protrusion.

When the bowel is greatly distended with air, and the reduction cannot be effected without dilating the external wound to an unwarrantable extent, or when the employment of the knife is rendered improper on account of the proximity of an important vessel, as the epigastric artery, the tube should be punctured with a large needle, or even with the point of a narrow bistoury, to let out the obstructing fluid. Such an operation, which should, of course, always be performed with the greatest care, can do no possible injury, certainly nothing like the injury that is inflicted in dilating the wound. A very delicate trocar, one not larger than a crow-quill, might be substituted for the needle and bistoury.

In the attempts at replacement, it is very important to know that the bowel has actually slipped into its natural situation. If the external wound is very devious, or if the peritoneum has been detached from its inner edges, a portion of the tube might be retained on the outside of the serous cavity, and thus experience all the bad effects of strangulation. To guard against such an event, the surgeon should not rest satisfied until he has assured himself that the passage is perfectly free, and that his finger has been fairly within the abdomen, in contact with the convoluted surface of the bowel.

Penetrating wounds of the abdomen are rarely unattended by some protrusion of the omentum. Sometimes, indeed, it is injured along with the bowel, pierced, cut, or contused. However this may be, it should always, in recent cases, be promptly restored to its natural position, but not, as a general rule, until after the reduction of the intestine, any bleeding vessels being previously secured with a small ligature, brought out at the external wound. When, on the contrary, the protrusion has existed for some time, and the parts have been assailed by inflammation, as evinced by their discoloration and the presence of plastic matter, the best plan will be to retain them in the wound; for if, in such an event, they are replaced, they will be very likely to provoke severe, if not fatal, peritonitis, whether they be returned in mass, or after the excision of the impacted portion. The parts which project beyond the wound may either be cut off on a level with the skin, or they may be permitted to slough, as they gradually will if let alone. In either case, the plug thus formed will be permanent, and so perfect as to offer an effectual barrier to the development of a hernia. When the patient is able to walk about, the parts should be supported for some time with a suitable bandage. It might be supposed that when the protruding portion of the omentum is assailed by inflammation, the morbid action would gradually extend to the peritoneum, but experience has shown that such an apprehension is groundless.

What should be the conduct of the surgeon in wounds of the bowel *without protrusion?* This occurrence is far more frequent than wounds with protrusion, and it therefore becomes a matter of paramount importance to determine, if possible, the proper mode of practice adapted to such an emergency. To my mind, the course to be pursued is perfectly clear. It has been seen that all wounds, however small, should be secured with suture, as the only guarantee against fecal effusion. Now, if this be true of small wounds, how much more important is it in regard to large wounds, which must inevitably be followed by an escape of the contents of the tube, and, as a necessary result, by fatal peritonitis? The discharge must be prevented, or, if it has already taken place, the most prompt and decisive measures must be adopted for its successful removal. How, then, is this to be accomplished? By the surgeon folding his arms, and looking upon the scene as an idle and disinterested spectator? If he does, his patient will as certainly perish from peritonitis as if his skull had been violently fractured, and a large portion of his brain let out, or as if he had swallowed an overdose of hydrocyanic acid, arsenic, or any other deadly poison. The proper mode of treatment, then, resolves itself into this, to dilate the external wound, if it is not already sufficiently large, to close the orifice in the bowel, and to clear away the effused matter. By this procedure, promptly and efficiently executed, the patient is certainly not placed in any worse condition, to say the least, than a female who has undergone the Cæsarean section, or a person whose abdomen has been ripped open in the first instance; recovery from which is, as is well known, by no means infrequent. The truth is, the fatality of penetrating wounds of the abdomen has been greatly exaggerated; and hence a degree of prejudice has arisen against this practice so deeply rooted as to render it almost impossible to surmount it by any course of argument, however well founded.

But this practice of dilating the external wound, and searching for the bowel, is not universally applicable. If, for example, the orifice in the intestine is very diminutive, as it may be supposed to be when it has been made by a small knife, such a step would be highly improper, as tending seriously to complicate an injury, which, if left to itself, might heal without the risk of fecal extravasation. Equally improper, in my judgment, would it be to pursue such a course when, from the history of the case, there is reason to believe that the bowel has been wounded in different places, as when the injury has been caused by a ball. An instance has already been detailed where a projectile of this nature perforated the tube at four separate points, involving the ileum, jejunum, duodenum, and colon. Such cases are necessarily fatal, and it is, therefore, not proper to aggravate the patient's suffering by making an extensive incision into the wall of the abdomen, with a view of sewing up the internal wound.

When the protruded parts are covered with dirt, feces, and blood, or other extraneous substances, they should be carefully cleansed before they are reduced. The best article for the purpose is tepid water, squeezed from a sponge held at some distance. The stream thus produced is well calculated to detach the foreign matter, whatever it may be, without the induction of additional irritation. On no account should the parts be sponged or wiped. If the matter adheres very firmly, it may be picked off with the finger or forceps. A similar course is pursued when the bowels are smeared with blood, feces, and other substances, without any lesion of its tunics.

When blood is extravasated in considerable quantity into the peritoneal sac, as is evinced by the soft and tremulous state of the pulse, the pallor of the countenance, the coldness of the extremities, and the constant disposition to swooning, the patient must immediately be placed recumbent, and take large and frequently-repeated doses of acetate of lead in union with opium. Sinapisms are applied to the hands and feet, and the abdomen is covered with cloths wrung out of cold water, or, what is better, with a large bladder partially filled with pounded ice, or some refrigerating mixture. The abdomen is, at the same time, encircled with a broad bandage, to afford equable support to the viscera, and thus assist in promoting the coagulation of the blood. When there is reason to suspect that a large artery has been opened, the most effectual practice will be to cut down upon the parts, and apply the ligature. Such a procedure, desperate as it may seem, would certainly be preferable, when the wounded artery is within reach, to letting the patient perish from hemorrhage.

The bowel having been replaced, the first and most important object is to guard against the occurrence of *peritonitis*, the great danger after every injury of this kind. Perfect quietude in the recumbent posture, the early and copious abstraction of blood, especially if the patient is plethoric, or the wound extensive, and the most rigid observance of the antiphlogistic regimen, are the means upon which reliance is mainly to be placed in the first instance. As to purgatives, their use is not to be thought of. On the contrary, the bowels must be locked up as speedily as possible, and so maintained for many days by the frequent exhibition of anodynes. Peristaltic motion must be effectually prevented until the wound is tolerably well cicatrized, and all danger of peritonitis passed. To insure this result, two grains of opium, or its equivalent of morphia, should be regularly administered at least every eight, ten, or twelve hours. The action of the medicine must be sustained, not wavering. Even the mildest enemata should be avoided, unless they are found to be absolutely indispensable to the comfort of the patient, by promoting the discharge of flatus. When, at length, it is determined to use purgatives, none but the most simple should be given, as Rochelle salts, Seidlitz powder, or citrate of magnesia. These articles not only, in general, agree well with the stomach, but they also liquefy the feces, thus rendering them less liable to be arrested at the affected part, to derange the sutures, and to disturb the healing process.

The pulse is attentively watched, in order that any tendency to undue reaction may be promptly met with the lancet, or the application of leeches to the abdomen. The amount of blood abstracted must vary according to the indications of the case, particularly the age and constitution of the individual, the return, continuance, or increase of local pain, the force and frequency of the pulse, and the extent of the injury. The first bleeding should, in general, be tolerably copious, but after this, six, eight, or ten ounces will be sufficient at each repetition. In this manner we prevent inflammatory action, or moderate it materially, if it has already taken place, without inducing too much prostration. It must be recollected that the pulse in peritonitis is hard, wiry, and contracted; a circumstance calculated to throw the practitioner off his guard, and lead him into the error of omitting the abstraction of blood at a period when it is loudly called for, and when, in truth, it can only be of any service in arresting the progress of the disease. The detraction of blood, however, is not always admissible. The shock sustained by the system may be unusually severe; the reaction may be tardy and imperfect; and the patient may lie, perhaps for several days, in a dozing state, with a small, tremulous pulse, pallid countenance, and cold extremities; demanding imperatively the employment of stimulants instead of depletory remedies. The abdomen is fomented with cloths wrung out of a hot solution of opium; sinapisms are applied to the extremities; and free use is made of brandy and carbonate of ammonia. The urine, if necessary, is drawn off with the catheter. Cough, if present, is combated by the usual means, its progress being arrested as speedily as possible, otherwise the concussion thus induced might prove detrimental by interfering with the reparative process. Tenesmus is relieved by anodyne injections or opiate suppositories. If the abdomen is very tender and tympanitic, it should be covered with a large blister, sprinkled with morphia, and retained until thorough vesication is produced.

The diet must be of the most simple nature. For the first few weeks it should consist chiefly of animal broths and amylaceous articles, as arrowroot, tapioca, or sago; afterwards it should be more nutritious, though still fluid. Solid, stimulating, or flatulent food must not be used for several months. Cold water, flaxseed tea, or gum Arabic water, simple or acidulated, form the best drinks. When irritability of the stomach exists, the use of ice will be grateful and beneficial. In a word, the patient should be half starved, and depleted as much as may be consistent with the restorative process. The treatment must be prompt and energetic. The great error generally is that blood is not abstracted sufficiently early, or before the peritoneal inflammation has made such inroads upon the system as to render it impossible to save the patient.

The external wound, in favorable cases, will require none but the most simple dressings, as it will generally unite by the first intention, when, should a fistule form, means must be employed to prevent the escape of fecal matter, and to induce it to resume its natural channel. When the patient is able to sit up, or walk about, the weakened parts are supported with a suitable truss, worn day and night, to guard against the separation of the edges of the wound, and the consequent protrusion of the abdominal viscera.

During convalescence, as well as for some time after, the bowels must be constantly kept in a soluble condition, in order that no undue accumulation of feces may take place in the injured portion of the tube; the diet must be light, but nutritious, and the food must be carefully masticated before it is swallowed. All rough exercise, as riding on horseback, jumping, running, and even rapid walking, must be prohibited.

SECT. III.—FOREIGN BODIES IN THE STOMACH AND BOWELS.

Foreign bodies, varying much in their character, occasionally descend into the stomach, and, becoming arrested there, cause great distress, and sometimes even death. Jugglers in the exercise of their profession and persons intent on self-destruction, are, perhaps, the most common subjects of such accidents. A few years ago a man in Iowa, in performing some tricks at legerdemain, allowed a bar of lead, ten inches long, by upwards of six lines in diameter, and weighing one pound, to fall into the stomach. The usual symptoms are, violent pain in the epigastrium, extending about in different directions, a sense of weight and obstruction in the stomach, nausea, and constipation of the bowels. The patient is generally able to walk about, and even to attend to business, especially during the first few days after the introduction of the extraneous body.

The manner in which these substances are disposed of varies. Pieces of bone, cartilage, pins, needles, and coins, often pass into the bowels, and are finally discharged along with the feces. When the body lodges, and is productive of pain and danger, extrusion must be effected with the knife, the place of incision being regulated by the site of the intruder, which may often be distinctly felt through the walls of the abdomen. In the case above alluded to, Dr. Bell, of Wapello, removed the bar of lead by making an incision, four inches in length, from the umbilicus to the false ribs, some distance beyond the median line. The opening made in the stomach was just large enough to admit of the passage of the bar, and required no sutures, as it became immediately closed by the contraction of the muscular fibres of the organ. The external wound was stitched in the usual manner. No untoward symptoms occurred, and the man recovered in less than a fortnight.

The astonishing faculty which the stomach possesses of accommodating itself to the presence of foreign bodies, is strikingly illustrated in the remarkable cases recorded by Borelli, Fournier, Harrison, and others, in which the most curious substances, as pieces of wood and iron, nails, forks, spoons, knives, buckles, compasses, door-hinges, and pieces of coin, were swallowed, sometimes in large numbers, and in rapid succession, with very little immediate suffering, though they all ultimately proved fatal.

Gastrotomy was first performed by Gruger, a Polish surgeon, in 1613. His patient, a farmer, had swallowed a small knife, and he survived the operation ten years. Shoval repeated it in 1635. Professor Frizac, of Toulouse, performed the operation in the latter part of the last century for the removal of a knife-blade, two inches long. As a means of prolonging life in organic stricture of the œsophagus, threatening starvation, gastrotomy has attracted considerable attention during the last ten years, especially in Europe. The principal operators have been Sédillot, Fenger, Forster, and S. Jones, but the results have not been of such a nature as to encourage repetition, all the patients having died within a short time after the undertaking, either from exhaustion or peritonitis. But even supposing that life was not put in immediate jeopardy by the operation, what ultimate good, it may be asked, could reasonably be expected from it? None whatever; for, the disease of the œsophagus being malignant, death will soon be inevitable, and, hence, the adoption of such a measure would only be a species of refined cruelty, reflecting no credit upon the surgeon. The only case in which, in my judgment, gastrotomy would be justifiable, apart from the presence of a foreign body in the stomach, is where the stricture is the result of a scald or burn, or of the contact of some caustic substance, as nitric acid, lye, or potassa, completely destroying the power of deglutition.

Should the operation be deemed advisable, it may be executed, according to the method of Sédillot, by making, on the left side of the middle line of the abdomen, about two fingers' breadth from the costal cartilages, and a short distance below the ensiform portion of the sternum, a crucial incision three inches in length, first through the skin, then through the muscles, and lastly through the peritoneum. Inserting the index finger into the wound, the surgeon feels for the left border of the liver, which he takes as a guide to the stomach. The organ is then drawn forward, examined, and carefully stitched, by its anterior surface, to each limb of the cutaneous flap by silver wire, after which an opening is made into it, about midway between its two extremities, and a little above its lower margin. When the consolidation is sufficiently firm, as it will be in three or four days, to prevent the possibility of separation, nutritive injections are introduced from time to time to sustain life. The wound gradually becomes fistulous, and thus affords ready access, should the patient survive, to the stomach. When the orifice is pretty well cicatrized, a silver tube, provided with two rings, and resembling in shape a shirt button, may be worn to prevent undue contraction.

The operation of *enterotomy* is sometimes required on account of the presence of a foreign body in the bowels, whether formed within, or introduced from without. In this country, intestinal concretions are exceedingly rare, but in certain parts of Europe, especially in Scotland, they are by no means uncommon, and occasionally call for the use of the knife. In the latter country, they usually consist of the fibres of the beard of the oat, cemented together by albumen and phosphate of lime, and sometimes acquire a very large bulk, weighing many ounces, and even three or four pounds. When small, they generally move about, changing their place from time to time; but when the reverse is the case, they are liable to become impacted in a kind of pouch, formed by the expanded tube. In general, they are solitary, but now and then quite numerous, as many as several dozens being found in the same individual. Their increase is usually tardy. The symptoms denotive of their presence are colicky pains, a sense of weight and soreness at the site of the concretion, dyspeptic derangement, and mechanical obstruction to the evacuation of the feces, with gradual emaciation, and failure of the general health. When the foreign body occupies the rectum or sigmoid flexure of the colon, the patient is tormented with a constant desire to go to stool, tenesmus, and distress in the sacro-lumbar region. When the concretion is large, or the emaciation considerable, it may generally be felt through the walls of the abdomen, and, if several are lodged together, they may even be made to strike against each other, so as to cause a distinct noise.

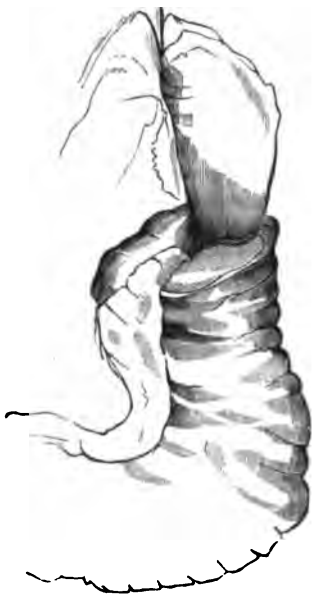
These concretions are sometimes ejected by vomiting or stool; when situated in the rectum, they may occasionally be extracted with the finger, scoop, or forceps. When they are not disposed of in this way, and life is in danger, enterotomy must be performed, and, not unfrequently, the operation proves successful. An incision of adequate length being made through the abdomen, in the direction of the muscular fibres, at the site of the foreign body, the bowel is laid open to an extent barely sufficient to seize and extract it, when the opening is immediately closed with the continued or interrupted suture, as may be deemed most advisable. The external wound is treated in the ordinary manner.

Foreign bodies, introduced from without, give rise to the same train of symptoms as those formed within; but, in general, the effects are more violent, and the treatment requires to be more prompt and decisive. When the ordinary remedies have failed, recourse is had to the knife, the two wounds being managed afterwards in the same manner as in the former case. The operation is, unfortunately, not often successful, chiefly for the reason, perhaps, that it is commonly performed too late. In a case under Dr. Samuel White, of Hudson, early in the present century, a large teaspoon, swallowed in a paroxysm of delirium, was extracted in this way from the ileum, and the man recovered in a few weeks.

SECT. IV.—INTESTINAL OBSTRUCTION.

Obstruction of the intestines may arise from various causes, some of them of the most opposite character, and a knowledge of this fact suggests the propriety of arranging it under the following heads:—1. Internal strangulation from the development of a membranous band, from the attachment of one portion of bowel to another or to an adjoining organ, or from unnatural adhesions of the free extremity of the vermiform appendage, omentum, ovary, or Fallopian tube. 2. Rotation of the tube upon its own axis, or round an axis formed by the mesentery. 3. Compression of one portion of bowel by another, by a tumor, an enlarged ovary, or a diseased uterus. 4. The interception of the intestine by an opening in the mesentery, omentum, or mesocolon. 5. Intussusception of the tube, or the falling of one portion into another. 6. Stricture, generally the result of carcinoma. 7. Concretions, foreign bodies, worms, or indurated fecal matter. 8. Paralysis. 9. Spasm. 10. Inflammation. The obstruction, however induced, presents itself under two distinct varieties of form, the acute and the chronic, each being characterized by a peculiar train of phenomena.

Fig. 442.



Intussusception of the bowel.

Acute obstruction is generally occasioned by internal strangulation by membranous bands, morbid adhesions, or some diverticulum; by a sudden twist of the bowel or a rotation upon its axis; by the passage of a coil of intestine into an abnormal aperture in the mesentery, omentum, or mesocolon; or by the occurrence of intussusception, or the falling of one portion of bowel into another, as in fig. 442, from a preparation in my collection. It may also arise from inflammation or spasm, although this is uncommon.

The symptoms which characterize this form of obstruction are generally of a most severe nature; they are more or less sudden in their appearance, and they bear the closest resemblance to those which denote the existence of strangulation in hernia. The individual may be in the most perfect health at the moment of their occurrence, or he may have been more or less unwell, although still able to attend to his accustomed business. The disease is usually ushered in by pain in a particular portion of the abdomen, of a sickening, griping, or colicky character, and soon followed by decided nausea, and a sense of constriction in the situation of the strangulation. Prostration is an early symptom. The vital powers are depressed, as if the system had received a violent shock. Excessive restlessness exists. The patient is in great agony; he tosses about in bed, his thirst is intense, and he is overwhelmed with despondency. The vomiting increases in frequency, and the ejected matter, consisting at first simply of ingesta, or of bile and mucus, at length becomes stercoraceous; the belly is exquisitely sensitive, so much so that the slightest pressure of the finger is almost intolerable; the bowels are tympanitic and obstinately constipated; the lower limbs are retracted to take off the weight of the abdominal muscles; the pulse is small, frequent, and wiry; the features are pinched; the extremities are cold; the mind wanders; in a word, the suffering is intense. By and by, muttering delirium sets in, the countenance exhibits the Hippocratic expression, the tongue is dry and black, the surface is covered with clammy perspiration, there is hiccup with twitching of the tendons, and, unless relief is speedily procured, the patient dies either from exhaustion or mortification of the bowel. The period at which this event occurs varies, on an average, from six to eight days. Sometimes it takes place as early as forty-eight hours from the commencement of the attack. Dissection generally reveals all the evidences of a high state of peritonitis.

In *chronic obstruction* the obstacle to the onward passage of the feces usually depends upon organic disease of the bowel, as stricture of the rectum, sigmoid flexure of the colon, or ileo-cæcal valve; the presence of indurated feces, foreign matter, morbid growths, worms, or intestinal concretions; or, finally, upon the pressure produced by some tumor, as an enlarged ovary, uterus, or Fallopian tube.

The symptoms are much less violent than those which mark the acute attack. Their development is gradual, not sudden and overwhelming. The individual is unwell; his disease is slowly but steadily gravescent, worse at one time, and better at another. The chief trouble, at first, is constipation of the bowels, with rumbling noises and frequent eructations, disordered appetite, more or less torpor of the liver, and progressive failure of the strength. Colicky pains are occasionally experienced, and defecation is performed with great difficulty, being always accompanied with straining and tenesmus, and, at times, with prolapse of the rectum. Not unfrequently obstinate constipation exists. Sometimes the bowels are not relieved for days or even weeks, although the desire to do so may be most urgent. This is especially liable to be the case when the obstacle is seated in the rectum, from the pressure of the fecal matter upon the pelvic nerves. After the case has proceeded in this manner for a variable period, it gradually or suddenly assumes a more serious character, evidently dependent upon the occurrence of inflammation which never fails to mark the close of the affection, whatever may be the nature of the exciting cause. The peritoneum is now the chief seat of the disease, and the danger is always in proportion to the extent and violence of the attack. In many cases, the morbid action involves the entire membrane, visceral and parietal; in some, it is more limited, being confined to the parts around the seat of the obstruction. The features are pinched and shrunk, the pulse small, frequent, and wiry, the abdomen tender and tympanitic, the stomach nauseated and unable to retain even the blandest fluid, and the surface covered with clammy perspiration. The strength rapidly fails, the mind wanders, hiccup and muscular twitchings ensue, and the patient sinks very much as one dying of mortification from strangulation of the intestines. In the worst cases, stercoraceous vomiting is sometimes present.

Diagnosis.—The diagnosis of intestinal obstruction is often determined with difficulty. It is generally sufficiently easy when it depends upon disease of the rectum situated within reach of the finger or probe, or when it is occasioned by the presence of indurated fecal matter, an intestinal concretion, or some foreign body known to have been swallowed but not passed by the anus. In almost all other cases it must necessarily be obscure.

The affection with which it is most liable to be confounded is hernia; for, whenever the case is one of sudden occurrence, the symptoms of the two diseases are absolutely identical. Error here is not always avoidable even when the attendant is thoroughly upon his guard in respect to the probable nature of the case. The symptoms of hernia are sometimes extremely obscure. In the incomplete variety of the affection, there is often an entire absence of everything like a tumor, and the consequence is that the surgeon is left wholly in conjecture as to the precise character of the complaint. A very minute portion only of the wall of the bowel may be intercepted, and yet the transmission of fecal matter may be as effectually arrested as if the entire caliber of the tube were constricted. The symptoms of strangulation exist in full vigor, but no practitioner, however intelligent, can possibly affirm whether they are produced by a hernia, properly so called, or by mere internal obstruction. I have witnessed a number of such cases, and it need hardly be added that every one proved fatal.

In intussusception of the bowel, the access of the symptoms is generally sudden, and without any assignable cause. The individual is seized with violent pain in the abdomen, attended with nausea and vomiting, without any tension, tenderness, or appreciable tumor. The countenance is pallid, and he feels weak and depressed. Obstinate constipation exists, and the case effectually resists all attempts at relief, both by the mouth and the rectum. The suffering steadily progresses. The pain increases in violence; the abdomen is tympanitic and exquisitely sensitive; the pulse is small, hard, and frequent; the eyes are sunk; the anxiety is intense; and the vomiting is stercoraceous.

In obstruction dependent upon the pressure of a membranous band, a twist of the bowel upon its axis, or the passage of a coil of intestine through a hole in the mesentery, omentum, or mesocolon, the symptoms so closely resemble those of invagination and ordinary hernia as to defy all attempts at accuracy of discrimination. The most prominent phenomena are, violent pain and tension of the abdomen, with great tenderness on pressure, excessive restlessness, fecal vomiting, pinched features, and a small, quick, thready pulse.

Obstruction caused by colic occasionally produces confusion in regard to the diagnosis of the case. In general, such attacks are dependent upon disorder of the digestive organs, or the presence of ingesta, bile, or acid in the alimentary canal. The pain is spasmodic, relaxing and increasing in severity with temporary intermissions; there are frequent eructations and rumbling noises in the bowels; the patient rolls about and seeks relief by compressing the abdomen; there is no fecal vomiting; and alvine evacuations occur either spontaneously or through the agency of medicine.

The passage of a gall-stone sometimes closely simulates the symptoms of intestinal obstructions, especially those dependent upon strangulation. The attack usually comes on within a few hours after a hearty meal, with severe pain, like that of colic, referred to the hypochondriac region, and paroxysmal in its recurrence, with intervals of comparative ease. The pain is generally extremely agonizing, and is always relieved by pressure. There is distressing nausea, with frequent vomiting of acid matter; the patient is excessively restless, rolling and tossing about in bed; the countenance is pale; the pulse is slow and weak; the tongue is foul; and the surface is covered with a cold sweat. If relief is not speedily afforded, the skin assumes a jaundiced aspect, the urine is tinged with bile, the abdomen is tender on pressure, especially the epigastric region, and there are often well marked rigors. When the concretion is very large, it may, upon escaping from the gall-bladder, obstruct the bowel, and thus occasion obstinate constipation, with all the symptoms of internal strangulation.

The most important phenomena, diagnostically considered, are, the spasmodic character of the pain, the icterode condition of the skin, the presence of bile in the urine, the soft and open state of the pulse, the absence of constipation and fecal vomiting, and the sudden cessation of suffering the moment the calculus escapes into the bowel.

Obstruction dependent upon mechanical causes, as morbid growths, concretions, foreign bodies, or indurated feces, may occasion much suffering, but in most cases the symptoms are for a long time comparatively mild, the bowel gradually accommodating itself to its new relations. Eventually, however, the case assumes a more serious character, and, if relief is not obtained, the patient perishes from peritonitis, preceded by excessive distension and tenderness of the abdomen, and great prostration of the vital powers.

The diagnosis of this kind of intestinal obstruction must often necessarily be very obscure. A stricture, carcinoma, hardened feces, or an intestinal concretion, occupying the lower part of the rectum, may generally be detected with the finger, probe, or bougie; but when the source of the difficulty is higher up, there can be no certainty as to its precise nature. When the impediment is very great, it may sometimes be detected through the walls of the abdomen, but such an occurrence must be very uncommon. Occasionally the obstacle is external to the tube, as when it is caused by an ovarian, uterine, or mesenteric tumor, and then the diagnosis is generally sufficiently evident.

Obstruction from mere torpor of the bowels is most common in nervous, hysterical females, and is usually readily recognized by the history of the case, the frequent eructations, and the rumbling noises in the abdomen. Obstinate constipation sometimes arises from injury of the spine.

The diagnosis of intestinal obstruction, the result of peritonitis, is marked by great uncertainty. The most reliable circumstances are, the tympanitic and tender state of the abdomen, the small, thready pulse, the coldness of the extremities, the frequent eructations with occasional vomiting, or regurgitation of the contents of the stomach, dorsal decubitus, absence of severe pain, shrunken features, general prostration, and obstinate constipation.

Much light is sometimes thrown upon the diagnosis of these affections by the history of the case, as the nature of the exciting cause, the peculiarity of the attack, and the character of the symptoms. When the attack is sudden and violent, and speedily followed by peritoneal inflammation, the presumption is that it is dependent upon internal strangulation; while, if it is slow in its progress, or decidedly chronic, the probability is that it has been occasioned by mere torpor of the bowel, attended with fecal impaction, or by the presence of some morbid growth, carcinoma, stricture, intestinal concretions, worms, or foreign matter.

The pain in internal strangulation generally comes on suddenly, and, although it is liable to remit, it is nearly always continuous. It usually begins at some particular spot, from which it is more or less rapidly diffused over the rest of the abdomen. In the more severe cases it may be so intense as to cause death in less than forty-eight hours, the patient sinking as if he were laboring under violent shock. In the chronic form of the disease, on the contrary, there may be almost an entire absence of pain for days and even weeks together.

Along with pain there is generally, in the more severe forms of the affection, considerable tenderness of the abdomen, either circumscribed or diffused. When the obstruction is rapid, it usually appears early in the attack, and is often so great as to render the slightest pressure of the finger intolerable.

Tympanites is a constant symptom, but of itself of little diagnostic value, as it is a concomitant of many other affections. It generally arises gradually, and often proceeds to a most distressing extent. When it exists in a very high degree, the abdomen is as tight as a drum, and the distended coils of intestine may readily be perceived through its stretched parietes.

The constipation is commonly complete. Sometimes, however, a small evacuation takes place, or a little fecal matter may be brought away by an enema. In the chronic form of the disease, the patient often labors under distressing tenesmus with a frequent desire to relieve himself. A discharge of blood, or of offensive mucus, is a frequent attendant upon intussusception, especially if the disease has made some progress.

Vomiting is seldom absent. In acute obstruction it commonly appears within a few hours after the attack, and continues, as a prominent and distressing symptom, until the case terminates. When the obstruction is chronic, it may not come on until late in the attack, or until there is serious peritoneal involvement. It is usually most harassing when the obstacle is seated in the small bowel, and when the patient is subjected to the use of irritating cathartics. It generally continues until the ejected matter acquires a fecal character.

Distressing hiccup often attends, especially when the impediment exists in the upper portion of the small bowel. It is, however, a symptom of no diagnostic significance.

The precise seat of the obstruction can only, as a general rule, be determined when the disease upon which it depends is situated in the rectum or lower part of the colon, within reach of the finger, probe, or tube. In most other cases, only an approximative opinion can be formed. When the constriction is in the small bowel, or at the ileo-cæcal valve, the swelling is usually central, and less considerable than when the large intestine is distended. When the inflation exists mainly in the colon, the tube not unfrequently forms a kind of belt round the boundaries of the abdomen, the outline of which may be distinctly traced through the stretched and attenuated parietes with the finger, if not also with the eye. An enormously distended cæcum is occasionally thrust over into the left hypochondriac region, where it presents itself as a large prominence, emitting a clear sound on percussion. In intussusception, a distinct tumor, more or less hard, and of an elongated, cylindrical form, may generally be traced; a circumstance which, coupled with the existence of bloody mucous discharge, is almost characteristic of the nature of the affection. Finally, in distension of the large bowel, there is always unusual fulness of the loins with remarkable resonance on percussion.

The symptoms are generally most urgent when the small bowel is involved; the pain and vomiting come on at a very early period, often, indeed, within the first few hours, and the attack is characterized by uncommon severity; the abdominal tenderness is greater, the pulse smaller, and the prostration more rapid and profound.

The impossibility of inserting a long tube into the bowel may generally be taken as an evidence that the obstruction is seated in the upper part of the rectum or in the sigmoid flexure of the colon; but it must not be forgotten, in the use of this instrument, that it may bend upon itself, and so convey erroneous information. When the impediment is situated low down in the rectum, its character may always be readily ascertained with the finger, probe, or bougie.

It has been alleged that important diagnostic information may be derived in these cases from the quantity of urine that is secreted Dr. Barlow has called special attention to the subject, and the conclusion at which he has arrived is that a diminished flow of this fluid may generally be regarded as denotive of the existence of obstruction of the small bowel, particularly of the jejunum and of the upper portion of the ileum, on the assumption that the tube is no longer able to perform the function of absorption. There are, however, so many exceptions to this rule as to render it impossible to deduce any diagnostic value from it.

Finally, it should be borne in mind that cancerous obstruction is most common in the sigmoid flexure of the colon, and intussusception in the left portion of the large intestine, the displaced tube often lying in the rectum, and sometimes even protruding at the anus. Moreover, whenever the case is of an acute character, simulating strangulation, a most thorough examination should be made of the abdomen, especially in the situation of the inguinal, femoral, and pelvic apertures, for some of the more obscure forms of hernia; for it has often happened that the obstacle, instead of being internal, has been found after death to be external, a small portion of bowel having been intercepted by the edges of one of the rings.

Great uncertainty in regard to the diagnosis often arises when intestinal obstruction occurs in a person laboring under chronic hernia. The obscurity, in such an event, can only be cleared up by a most careful exploration of the parts concerned in the protrusion. If the hernia is reducible, the finger should be carried into the abdominal ring, and if, after this, doubt still exists as to the real nature of the case, the proper plan is to operate.

Treatment.—In the absence of correct diagnostic intelligence, the treatment of intestinal obstruction must often be conducted in a purely empirical manner. One important fact, however, in regard to the subject is now fully settled, the avoidance of everything in the form of irritating medicine, until recently so much employed even by the best practitioners. If a drastic cathartic, as colocynth, scammony, jalap, or croton oil, has occasionally afforded relief, it is very certain that the tendency of such an agent generally is to do harm, by increasing the gastric distress and promoting abortive peristaltic action of the bowels. The same objection is applicable to the exhibition of crude mercury, which, instead of unlocking the intestine, only, in most cases, augments the mechanical impediment. Numerous instances have been published in which enormous quantities of this metal were found, after death, in the bowel without, apparently, having made the slightest impression upon the obstruction.

In the milder cases success will often attend our treatment, and even in the more severe ones the surgeon need not always despair of being able to surmount the difficulty. In intussusception, nature occasionally affords relief by the establishment of mortification, eventuating in the separation and discharge of the invaginated portion of the tube. In my private collection is a specimen of colon, twenty-nine inches in length, presented to me by Professor Dawson, of Columbus, Ohio, and passed by a child six years of age, who, notwithstanding, made an excellent recovery. In 35 cases, analyzed by Dr. William Thomson, the invaginated pieces varied in length from six inches to three feet, and nearly all included the entire cylinder of the tube along with a portion of the mesentery. The small bowel was concerned in 22 cases, and the large, or large and small, in 13. The average duration of the disease was from four to five weeks. To insure so favorable a result, it is evident that everything should be done to sustain the system, and that all perturbating measures should be carefully refrained from, especially during the elimination of the slough, otherwise they may break up the adhesions.

The great remedy, in nearly all cases, whether dependent upon strangulation, or constipation, is opium, administered in liberal and sustained doses. The object is not merely to allay pain and gastric irritability, but, for a time at least, to prevent the peristaltic action of the bowels. In this way, especially in intussusception, an opportunity is afforded to the affected intestine either to unroll itself or to throw off the invaginated portion, whereas, if the tube has been twisted upon its axis, or strangulated by bands of lymph, a diverticulum, morbid adhesions, or a hole in the mesentery, the patient will be made comparatively comfortable, and thus placed in a better condition to bear up under surgical interference, should this eventually become necessary. When the difficulty depends solely upon torpor of the bowels, experience has shown that the steady, persistent use of opium will, in time, more effectually relax them than any other remedy; and the same treatment is strictly applicable when the obstacle is occasioned by spasm. The quantity of opium should not be less than two grains, given every six or eight hours, according to the urgency of the case. When there is marked disorder of the secretions, a minute quantity of calomel, as one-half a grain to a grain, may often be advantageously combined with the anodyne, but anything like a large dose of the article would be decidedly prejudicial, from its tendency to excite nausea, to provoke peristaltic action, and to depress the system. When great torpor of the bowel exists, strychnia may be serviceable.

Gastric distress may generally be relieved by effervescing draughts, the neutral mixture, or lime-water in milk.

Abdominal tenderness should be assuaged with leeches, and fomentations, medicated with laudanum. A light emollient cataplasm, similarly prepared, sometimes answers a good purpose. When the distress is very great the best plan is to cover the abdomen with a large blister, well sprinkled with morphia.

Great relief has sometimes followed [illegible] From facts lately developed it is [illegible] sionally be cured in this manner the bowel [illegible] action. Ice water, or pounded ice, applied to the [illegible]

The strength is maintained with [illegible] form as possible. Milk punch is generally [illegible] attack.

To remove the flatus, which is always a [illegible] answers so well as frequent injections of turpentine [illegible] water, and introduced with a long tube [illegible] obstinate cases trial should always be made with [illegible] intussusception great relief has occasionally followed the [illegible] tines with air introduced by means of a tube attached to a [illegible] displaced bowel projects through the anus or is low down in the [illegible] tion may be attempted with the fingers, a bougie, or [illegible] adult, with the hand. Tenesmus is relieved with [illegible] olive oil, mucilage of gum arabic, or infusion of [illegible]

My opinion has long been that great if not permanent [illegible] afforded in some of these cases of excessive flatulent [illegible] the bowel, as the escape of the fluid might not only enable the [illegible] contractility, but facilitate respiration by taking the pressure of the [illegible] and abdominal muscles. No opportunity, however, was presented [illegible] putting this idea in practice until last winter. The patient was a man [illegible] fifty-one, under the charge of Dr. Andrew N[illegible] He had [illegible] attack of obstinate constipation, attended with great pain in the [illegible] paroxysmal character, rumbling noises, and excessive [illegible] After continuing in this condition, alternately better and worse, [illegible] copious alvine evacuations occurred, and the health improved [illegible] was able to walk about his room. At the end of three weeks [illegible] symptoms returned in all their previous intensity. The pain and [illegible] steadily increased, the stomach was oppressed with nausea and [illegible] move the bowels with purgatives, enemas, and a long [illegible] When I saw the patient, the tympanites was so excessive that he was [illegible] to breathe or swallow. As a dernier resort, I introduced a very [illegible] at the middle line, first about two inches below, and then about the same [illegible] above, the umbilicus. A large quantity of gas, of a fecal odor, escaped [illegible] orifice, followed by great relief of the suffering and the most marked [illegible] of the size of the abdomen. The improvement continued for nearly a [illegible] when the man became gradually worse, and died exhausted in less than a week, no alvine evacuation having occurred during the entire period of thirty-five days.

The cause of the obstruction was found to be a tight scirrhous ring at the lower part of the sigmoid flexure of the colon, completely occluding the tube. The whole of the large bowel was enormously distended with gas and fecal matter, especially the latter, more or less displaced, and upwards of twelve inches in circumference. A gangrenous perforation existed in the descending colon, and the mucous membrane was ulcerated at two points. The peritoneum of the lower portion of the abdomen was highly inflamed, and there was some effusion of serum and lymph.

Although this case necessarily terminated fatally, it is evident that the operation afforded great relief, and I can see no reason why it should not be frequently practised, on the principle, if nothing more, that anything calculated to ameliorate suffering is proper under such desperate circumstances. In Bolivia, where gastro-intestinal pneumatosis is very common, especially among the natives who live almost exclusively on vegetables, puncture of the stomach has been repeatedly performed with very gratifying results. Of 20 cases operated upon by Dr. Olivieri 8 were perfectly successful.

As to the propriety of enterotomy, in such cases, the question presents great difficulties. Of these the most important are the uncertainty of the nature of the disease, and the fact that the division of the peritoneum is always attended with extreme risk to life, especially when it is severely congested, if not actually inflamed. An operation may be performed for one of two objects, either to relieve internal strangulation, or to establish an artificial anus, as when the obstruction depends upon the existence of carcinoma of the colon. In the former case, the peritoneum must necessarily be cut; in the latter, on the contrary, it may readily be avoided by making the opening in the lumbar region. In two instances in which, after mature consultation with eminent physicians, interference was deemed advisable, I signally failed in conferring the slightest benefit by these procedures, one patient dying at the end of four hours, the other in less than thirty-six. I have myself no taste for this kind of interference. In internal strangulation, depending upon intussusception, a twist, or the interception of the bowel by an aperture of the omentum, the diagnosis is so uncertain that the proper time for relief is usually allowed to pass before an operation is agreed upon, and when, at length, it is performed, the case must, almost of necessity, speedily terminate fatally.

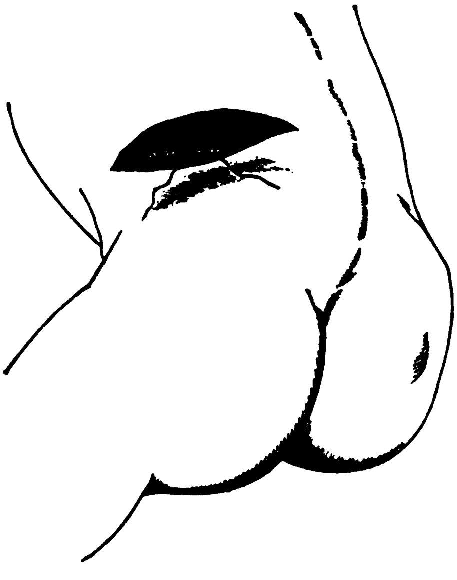
SECT. V.—FORMATION OF AN ARTIFICIAL ANUS.

The establishment of an artificial anus is generally supposed to be indicated when life is placed in imminent jeopardy on account of the existence of some insurmountable mechanical obstacle to the evacuation of the feces. The operation, under such circumstances, is considered not only as justifiable, but as imperatively called for by every principle of humanity and sound judgment. That this is the universal opinion upon the subject, is proved by the fact that numerous attempts have been made to devise a suitable operation for the purpose, and that every modern work on surgery, in whatever language it may be written, invariably refers to the procedure in terms of approval, if not of positive commendation. When we consider the object for which an artificial anus is usually established, we are struck with astonishment that this should be the case; that any one, possessed of the proper feelings of humanity, should seriously advocate a procedure so fraught with danger, and followed, if successful, by such disgusting results. I cannot, I must confess, appreciate the benevolence which prompts a surgeon to form an artificial outlet for the discharge of the feces in a case of imperforate anus in a child, in whom the rectum is either completely absent, or terminates blindly several inches above its normal situation; or in a case of scirrhus of the bowel in an adult, in whom, from the very nature of the disease, life cannot possibly be prolonged beyond a few brief weeks or months at farthest. Let the surgeon, if he is a parent, ask himself the question, whether he would not rather see his child die without an attempt at relief than to place it in a condition that would only render it an object of disgust to itself, and of loathing to every one around; or, if he is a husband, whether it would not be more in consonance with the dictates of humanity to abandon his wife to her fate than to undertake to eke out for her a miserable existence by such a pitiful and revolting expedient? I have performed the operation but twice, and I do not think that anything could ever induce me to attempt it again. While it is impossible to bestow too much praise upon those who first conceived and executed the design of affording aid to this unfortunate class of sufferers, it is evident, from the statistics that have been published upon the subject, that the operation is founded upon misdirected sympathy, and that it ought to be discarded as among the obsolete devices of surgery. I shall, nevertheless, as this work is intended to exhibit an outline of the existing state of the science upon every topic of which it treats, append a concise account of the more important procedures that have been suggested for the accomplishment of the object under consideration.

Littre, as early as 1710, proposed, in a case of imperforate anus, to reach the bowel by an incision through the left lumbar region, the design being to open the sigmoid flexure of the colon, and then to secure the orifice in the tube to the wound in the walls of the abdomen by means of a thread passed through the mesentery. The first attempt, however, to carry out this suggestion, or, more correctly speaking, the principle upon which it was founded, was made by Pillore, of Rouen, in 1776, in the case of a man affected with a carcinomatous tumor of the rectum, completely obstructing the evacuation of the feces. The artificial anus was made in the cæcum, and the patient survived twenty-eight days, the immediate cause of death being violent inflammation of the jejunum, occasioned by the accumulation of an immense quantity of metallic mercury, taken previously to the operation. The first operation of this kind that was ever performed for the relief of imperforation of the anus was executed by Dubois, in 1783; but it was unsuccessful, the child dying on the tenth day. Duret, of Brest, in 1793, was more fortunate. He opened the sigmoid flexure of the colon of a child two days old, who not only survived the immediate effects of the operation, but, when last heard from, had attained the age of forty-two years. Four years after this, Fine, of Geneva, made an artificial anus in the arch of the colon, by cutting through the umbilical region of a woman, aged sixty-three, in a case of constipation from scirrhus of the upper part of the rectum. She lived upwards of three months and a half, when she perished from the effects of the disease.

Two distinct processes have been employed for establishing an artificial anus; in one, usually known as that of Littre, the bowel is entered through the peritoneum, both parietal and visceral; and in the other on the outside of that membrane, in the space left uncovered by the fold of the mesocolon. The latter was originally described by Callisen, of Copenhagen, in 1796, in his System of Surgery, but whether the suggestion was his own or not is not known. However this may be, the operation was almost universally condemned by the profession, on account of its supposed difficulties, until 1835, when it was revived and improved by Amussat, of Paris.

Fig. 443.



Amussat's operation for the formation of an artificial anus in the lumbar region.

The operation of Amussat, fig. 443, the only one which I shall formally describe, consists in perforating the bowel through the iliac fossa, midway between the last rib and the crest of the ilium, the incision commencing at the edge of the sacro-lumbar and long dorsal muscles, and extending horizontally forward for about four inches. The skin and subcutaneous cellular tissue having been divided, the muscles and aponeuroses are successively penetrated to the full extent of the external wound, constant use being made of the grooved director, especially as we approach the more deep-seated structures. In very corpulent subjects, it is sometimes necessary, in order to obtain a sufficiency of room, to incise the different muscular layers perpendicularly, so as give the wound somewhat of a crucial shape, but, in general, this may be obviated by drawing the parts forcibly asunder with stout retractors. The muscles involved in the operation are the broad dorsal, external oblique, internal oblique, and transverse abdominal, together with a small portion of the square lumbar, though this occasionally entirely escapes. The bottom of the wound is formed by a large quantity of cellulo-adipose substance, especially conspicuous in fat subjects; this must next be carefully divided with the finger, or handle of the scalpel, and the colon sought for as it lies in the iliac fossa, at a point almost midway between the anterior and posterior spinous processes of the ilium, but a little nearer to the former than the latter. The colon will generally be easily recognized by its greenish hue, by its fixedness, and by its distended condition, the latter causing the small intestine to be pushed out of the way. As soon as the cellular connections at the bottom of the wound have been severed, the bowel will project freely forward, and is then to be pierced with a tenaculum, in order to prevent it from slipping back after it has been incised. A transverse opening is now to be made into the most prominent portion of the gut, about two inches in length, and its edges tacked to those in the external wound by at least six sutures, two corresponding with each side, and one with each angle. The whole procedure of incising and stitching the bowel should be conducted with the greatest possible care, lest fecal extravasation occur, and so produce severe inflammation. Despite this precaution, however, it generally happens that a portion of the contents of the tube escapes as soon as penetration has been effected. Thorough clearance having been established, the patient is replaced in bed, and the part covered with tepid water-dressing.

Very little bleeding usually attends the operation, as but few vessels are divided, owing to the horizontal direction of the incision. In the operation of Callisen, in which the incision is perpendicular, the hemorrhage, on the contrary, is frequently considerable.

The operation of Amussat may be performed upon either side; in cancer of the rectum, or recto-anal region, however, it is always best to select the descending colon. The procedure is usually difficult of execution, especially in infants and children, and, unless conducted with great care and judgment, is very liable to be followed by injury of the peritoneum.

Any tendency to undue contraction of the artificial anus should be counteracted by means of tents; and pains should be taken, as soon as the parts have sufficiently recovered from the effects of the operation, to furnish the patient with a suitable apparatus for preventing the tendency to the escape of fecal matter. In some cases, there is a strong disposition to protrusion and eversion of the mucous membrane of the bowel, but this generally soon disappears of its own accord. The greatest attention must constantly be paid to cleanliness.

The *results* of the various operations performed for the establishment of artificial anus up to 1851 have been carefully brought together by Mr. Cæsar H. Hawkins, in an able paper in the thirty-fifth volume of the Transactions of the Medico-Chirurgical Society of London. The number of cases analyzed was forty-four, of which twenty-one perished within the first five weeks, while of the remaining twenty-three, five died within six months, eight were either alive or left uncertain under one year, and nine lived twelve months or upwards. One of the patients survived seventeen years. In forty-two of the cases in which the disease was known, nineteen were cancerous, and of these ten proved fatal within the first five weeks. Of the forty-four cases, the operation was performed through the peritoneum in seventeen, of which ten died, and seven recovered; and in twenty-seven cases external to the peritoneum, of which eleven lived upwards of five weeks. In two of the patients the small intestine was opened, and both died soon after the operation; three, in whom the cæcum was the seat of the anus, experienced a similar fate; while one in whom the arch of the colon was perforated lived for three months and a half. In all six the peritoneum had purposely been divided. The right colon and cæcum were opened through the peritoneum in four cases, of which not one recovered, while of six cases in which the serous membrane was left intact, only two died. The left colon was opened in eight cases through the peritoneum, of which three proved fatal. Of twenty cases in which the operation was performed on the left colon through the lumbar region, or according to Amussat's method, nine died, and eleven recovered; that is, they survived the operation five weeks and upwards. The age of the different cases, varying from twenty-one to seventy years, did not appear to exert any very material influence upon the issue of the operation. Finally, of the twenty-one cases which terminated fatally within the first five weeks after the operation, two only died of peritonitis.

From the facts furnished by Mr. Hawkins, it is obvious that the operation of

Amussat does not possess the advantages which were at one time ascribed to it, since the result of that operation, as compared with that of Littre, in which the peritoneum is opened through the walls of the abdomen, shows nearly an equal mortality.

SECT. VI.—INJURIES AND DISEASES OF THE LIVER.

Wounds.—Wounds of the liver are infrequent in civil practice, but common enough in military. Varying in their nature, site, and extent, they are generally attended with considerable hemorrhage, and are always to be regarded as serious accidents. The symptoms are often extremely obscure. The most reliable, perhaps, in a diagnostic sense, are, a fixed pain, and a feeling of weight in the region of the affected organ, and a discharge from the wound of bilious matter, of a yellowish or greenish color, very thin, and of a viscid consistence. Along with these symptoms there is generally gastric irritability, with frequent vomiting, great thirst, constant jactitation, and excessive prostration, occasionally amounting to complete collapse. If the patient survives a short time, the eyes, skin, and urine become jaundiced, and there is violent headache, with indescribable languor. Sometimes the nature of the accident is revealed by an escape of hepatic tissue at the wound. In most cases important information may be obtained, in regard to the probable character of the injury, by observing the situation and direction of the external opening, or the course pursued by the vulnerating body. When two orifices exist in the hepatic region, at opposite points of the body, and there is at the same time a discharge of bilious matter, there can hardly be any doubt respecting the diagnosis. In wounds of the gall-bladder there is commonly a flow of pure bile.

It is easy to understand why wounds of the liver are so frequently attended with severe hemorrhage. The organ is extremely vascular, having three distinct sets of vessels, the hepatic artery, the portal vein, and the hepatic veins; hence it is impossible for any weapon, however small, to penetrate the parenchymatous substance without dividing some of their branches. If the wound involves a large vascular trunk, the hemorrhage may prove speedily fatal.

A man, aged 28 years, in an affray, received a cut in the epigastric region, three inches long, and transverse in its direction. It penetrated the peritoneal cavity, wounding the left lobe of the liver, which projected through the external opening. He lived thirty-six hours, looking very pallid, and having a small, feeble pulse. He bled considerably at the wound. On dissection, performed by Dr. Gilpin, the medical attendant, we found the cut in the liver to be an inch and a half in length by three-quarters of an inch in depth; the parts around were incrusted with coagula, and nearly three quarts of fluid blood were contained in the abdominal cavity. There was hardly any trace of peritonitis. A little wound, not three lines in length, existed in the omentum. The man had evidently died from loss of blood, chiefly of the liver.

Wounds of the liver are nearly always fatal, generally within the first forty-eight hours after their infliction. The subjoined case, however, proved to be a happy exception to this rule.

A boy, aged eight years, was accidentally shot with a pistol, the ball entering on the right side, between the eleventh and twelfth ribs, nearly midway between the linea alba and the spine, and emerging on the opposite side of the spine, not quite half an inch from the median groove, both openings being situated on the same horizontal plane. Considerable hemorrhage followed, which, together with the shock of the injury, produced an alarming degree of prostration, lasting upwards of forty-eight hours. At my first visit, at the expiration of this period, he was literally in a state of collapse; the pulse could scarcely be felt, the extremities were cold, the respiration was almost imperceptible, and, in short, everything clearly indicated that he had received a most severe, if not a fatal, wound. He had taken neither food, drink, nor medicine since the accident, and lay in a profound stupor, from which it was impossible to rouse him.

Under the influence of injections of brandy and hartshorn, and sinapisms to the extremities, chest, and spine, the boy soon began to revive, and at the end of twenty-four hours the reaction seemed to be complete. A probe, introduced at the anterior wound, passed readily in the direction of the liver, but did not issue behind. In a few days free suppuration occurred, especially at the posterior orifice, attended by the discharge of a slightly greenish, viscid fluid, having every appearance of bilious matter. This continued for about ten days, when it gradually ceased, both wounds closing in less than a month. The treatment, after the establishment of reaction, consisted simply of an occasional laxative, and of light, but nutritious, food, with a liberal use of brandy. The recovery was complete. Six years after the accident, the anterior scar was four inches below the axilla, as the arm hung by the side, and six inches from the posterior one.

Wounds of the liver, inflicted with the sword, sabre, or bayonet, occasionally get well. Dr. N. R. Smith has recorded an instance of recovery from a stab in the liver with a table-knife; and a similar case, only much more severe, occurred to Dr. Roux, of St. Petersburg.

The liver is sometimes severely lacerated by falls, blows, or kicks upon the side, or by the compression caused by the body being forcibly jammed in between two hard, resisting objects, as a post and the wheel of a carriage. The number, extent, situation, and direction of the fissures vary so much in different instances as to render anything like a definite statement impossible.

The following case will serve as an example of such an accident:—A stout, athletic boatman, aged twenty-three, in a fit of delirium, jumped off the portico of a house upon the pavement below, a distance of fifteen feet, bruising and otherwise injuring several parts of his body. Death occurred in an hour after the accident. The liver, somewhat enlarged, softened, and of a dark bluish color, was found lacerated in thirteen places. The rents ran in different directions, and, with the exception of two, were perfectly distinct from each other. They varied in length from a few lines to four inches, and in depth from two and a half to six lines, none extending completely through the substance of the organ. The spleen was ruptured on its convex surface, the right kidney ecchymosed, and the small intestine extensively contused. The abdominal cavity contained upwards of eight pounds of fluid blood. None of the large vessels were injured.

In the *treatment* of wounds of the liver the great object is to limit inflammation, by the most perfect quietude, gentle enemas, and a careful restriction of the diet. If the patient is young and robust, he may require the use of the lancet; otherwise it will be better to content ourselves with leeches, fomentations, and blisters. When suppuration is threatened, mercury, to the extent of slight ptyalism, is administered, to modify the inflammatory action and favor resolution. Pain is relieved by the liberal use of anodynes.

When a portion of the liver protrudes at the wound, it should be promptly restored to its natural position, the opening being, if necessary, dilated for the purpose. If some time has elapsed since the occurrence of the accident, it might be proper to let it remain, inasmuch as its reduction might, in such an event, occasion fatal peritonitis. Instances have been related by Blankaard, Schmucker, Dieffenbach, Macpherson, and others in which the projecting piece was either cut off or removed by ligature, and yet a good recovery ensued.

Hydatic Tumors.—Hydatids, forming tumors of variable size and shape, and almost uniformly inhabited by echinococci, are occasionally met with in the liver, most generally upon its convex surface and at its inferior border, either alone or in union with similar products in other parts of the body. Usually arising without any assignable cause, their development is sometimes traceable to external injury, as a blow or fall upon the side; and, although they may occur at any period of life, they are most common from the age of thirty to that of fifty. In their shape they are generally globular, but when several are clustered together they are more or less compressed and flattened; they are occupied, while young and healthy, by a thin, saline, non-albuminous, colorless fluid, and are contained each in a dense, fibrous cyst, of a white, opaque appearance. In old cases, however, or when suppuration has taken place, the fluid is generally turbid, and tinged more or less with bile. Occasionally the tumor is filled with a substance resembling putty, plaster, or cheese, intermixed with fragments of dead hydatids.

Ordinarily of tardy growth, these hydatids manifest, in time, a disposition to perish, either in consequence of inflammation set up in their own structure, or as an effect of disease in the neighboring hepatic tissues, followed either by the death of the patient, or by a process of elimination by which they find their way into the bowel, gall-bladder, lung, or peritoneal cavity. In rare cases they escape through the walls of the abdomen. A liver, affected with hydatids, may be of the normal size and shape, though generally it is variously altered in these respects.

The *diagnosis* of hydatids of the liver must necessarily be very difficult, if not impossible, in the earlier stages of their existence. As soon, however, as they have attained a considerable bulk, they are commonly sufficiently easy of detection. A sense of weight and of uneasiness is generally felt, but severe pain exists only when the tumors are of rapid formation, inflamed, or so large as to interfere seriously with the functions of the organ. Up to this time also there is ordinarily no disturbance of the general health. The most important signs, diagnostically speaking, are the tardy but steady development of the growth, its globular shape, its comparative indolence, and its fluctuating character. As it increases, it gradually encroaches upon the walls of the abdomen, lifting them up, and thus causing a distinct projection, readily perceptible by sight and touch. During inspiration the hydatic fremitus, as it is termed, is sometimes noticed. When the tumor is of great bulk, there is generally extraordinary enlargement of the superficial veins of the abdomen. The affections with which it is most liable to be confounded are, abscess of the liver, carcinoma, enlargement of the gall-bladder, and aneurism of the aorta.

Abscess of the liver is comparatively rapid in its formation, and is invariably accompanied by well-marked symptoms of hepatitis, followed by rigors and severe pulsatile pain. Hydatids, on the contrary, are of tardy development, indolent, and unattended by inflammation, except when they are very old, or in a state of decay.

In *carcinoma* the tumors are multiple, forming small, hard, circumscribed projections on the surface of the organ. They are always accompanied by severe pain, of a sharp, lancinating character, and by more or less jaundice, followed, as the disease progresses, by unmistakable signs of the cancerous cachexia. Encephaloid has sometimes a soft, elastic feel, and may even afford obscure fluctuation.

In dilatation of the *gall-bladder*, there is invariably deep jaundice, which is rarely, if ever, present in hydatids, except in their more advanced stages. The affection, generally caused by mechanical obstruction, is marked by the existence of a smooth, globular tumor, free from pain and tenderness, characterized by a distinct sense of fluctuation, and situated at the lower border of the liver, the movements of which it readily obeys. The alvine evacuations always show an absence of bile.

From *aneurism* of the aorta, hydatids of the liver are distinguished by the absence of pain, pulsation, and bellows-murmur; by the more gradual development of the tumor; and by the freedom from sympathetic disturbance, always so prominent in aneurism. When the tumor is not arterial, but derives its pulsation from its proximity with the aorta, the nature of the case may, in general, be easily determined by placing the patient upon his knees and elbows, to favor gravitation.

When the walls of the abdomen are very thin, valuable information may be derived from the use of the exploring needle. If the fluid is clear and uncoagulable, the probability is that it is from an acephalocyst. When the tumor discharges itself externally or through the lungs, the fluid may contain characteristic hooklets, discoverable by the microscope.

When a hydatic tumor of the liver, after having been long indolent, inflames and suppurates, the occurrence will be denoted by severe pain and tenderness in the right hypochondriac region, followed by rigors, and excessive constitutional disturbance. The matter thus formed may discharge itself in different directions, precisely as in an ordinary hepatic abscess.

In the *treatment* of hydatic tumors of the liver nothing whatever is to be hoped for from internal medication. Indeed, our only reliance, and even this is a very slender one, is upon puncture of the sac with a very delicate trocar, introduced in such a manner as to prevent, if possible, the ingress of air. Care must be taken also not to permit any of the fluid to escape into the peritoneal cavity, lest it should provoke fatal inflammation. Unless the tumor is adherent to the walls of the abdomen, as it may be, if old and large, the best plan will be to establish, as a preliminary measure, a caustic issue over the most prominent part of the swelling, as in the treatment of hepatic abscess. When any doubt remains, as to the strength of the adhesions, the abdomen should be well bandaged after the contents of the cyst are withdrawn, in order to confine the liver, and thus oppose an effectual barrier to peritoneal mischief. If the operation is followed by suppuration of the hydatid, the patient will be almost certain to perish from the resulting irritation.

Serous Cysts.—Serous cysts of the liver may occur either in the substance of this organ, or upon its surface, immediately beneath the peritoneum, and are capable of attaining a large bulk, encroaching thus seriously upon the diaphragm and abdominal viscera, as well as upon the right hypochondriac and iliac regions. Like hydatids, they are generally of slow growth, and they may be either solitary or multiple, simple or multilocular. They are dull on percussion, fluctuate distinctly under the finger, and are generally unattended with pain and constitutional disturbance. Their contents are of a limpid, saline character, coagulable by heat, alcohol, and acids, thus differing essentially from those of hydatids. A serous cyst of the liver sometimes attains an enormous size. A few years ago I drew from a tumor of this kind, in a delicate female, aged twenty-three, nearly a gallon and a half of fluid, as clear as spring water No accident ensued, and she has remained well ever since.

A cyst of this kind might easily be confounded with a hydatid of the liver; in fact, the only mode of distinguishing between them is the use of the exploring needle. In a serous cyst the contents are always coagulable, whereas in a hydatid there is an absence of albumen. In both affections the fluid is saline, but less so in the former than in the latter.

A serous cyst may, like a hydatid, empty itself into a neighboring organ, or it may point externally, and ultimately open upon the abdomen, though such an occurrence must necessarily be very rare. When the fluid is poured into the peritoneal cavity, fatal inflammation will speedily follow. The proper treatment, of course, is tapping.

SECT. VII.—INJURIES AND DISEASES OF THE GALL-BLADDER.

Wounds of the gall-bladder are almost invariably fatal. In fact, the only authentic instance, so far as I know, of recovery, is one mentioned by Parroisse, in which a man received a gunshot injury in the right hypochondriac region. He died at the end of two years of thoracic disease, when the ball was discovered in this reservoir. The period at which death occurs varies, on an average, from thirty-six to forty-eight hours. In a case recorded by Dr. Stewart, in which the gall-bladder was traversed by a sword, the patient lived seven days. On the other hand, Mr. Edlin met with an instance of bayonet-wound of this sac, in which death was caused in thirteen hours.

Rupture of the gall-bladder is generally produced by falls, kicks, or blows, and may occur without any appreciable injury of the external surface of the body. A remarkable case, in which the gall-bladder was found separated from the liver, has been related by Dr. Kilgour. The injury, caused by a jump on the abdomen, proved fatal in thirty-six hours.

Wounds and lacerations of the cystic, hepatic, and choledoch *ducts* are followed by the same disastrous consequences as similar lesions of the gall-bladder.

Extraordinary *distension* of the gall-bladder, from an accumulation of bile, concretions, or hydatids, is occasionally met with, and may present points of the deepest surgical interest. The affection is, for the most part, due to mechanical obstruction, either temporary or permanent, of the cystic or choledoch duct. The tumor thus formed varies in size from that of a fist to that of an adult's head. In a case related by Gibson, it contained eight pounds of inspissated bile, and was so large as to reach over into the left hypochondriac region, to force out the ribs on both sides, and to cause great embarrassment in breathing. Parallel examples have been recorded by other observers. The swelling is generally of a globular shape, with a smooth outline, and a distinct sense of fluctuation, especially when it is of unusual bulk, or, indeed, even when it is comparatively small, provided the abdominal walls are abnormally thin. Its most common situation is the hypochondrium, where it often projects below the cartilaginous margins of the right ribs; cases, however, occur in which it is most prominent in the epigastrium, towards the umbilicus, or in the iliac region. The contents of the distended gall-bladder do not always consist of bile, although generally they do. When its coats are inflamed, the fluid may be purulent, or pus may find its way into it from an abscess of the liver. In most instances there are biliary concretions; and examples have been recorded in which the fluid contained hydatids.

The tumor formed by a distended gall-bladder is free from pain and constitutional disturbance, and is generally very tardy in its development. When the obstruction upon which it depends is permanent, dyspeptic symptoms at length ensue, and the whole surface becomes deeply jaundiced. When the gall-bladder is very large, it may occasion great difficulty of breathing and other symptoms of mechanical embarrassment. The principal affections with which it is liable to be confounded are abscess, hydatids, and encysted tumors of the liver.

In *hepatic abscess* there are always well marked symptoms of inflammation, accompanied by pyrexia, rigors, and throbbing pain. As the matter accumulates, the hypochondrium becomes swollen, tense, and exquisitely tender, and, finally, œdematous. The disease progresses comparatively rapidly, and the fluctuation is very obscure, until the abscess is almost ready to burst. In the tumor formed by a distended gall-bladder, on the contrary, there is no fever or severe pain, unless inflammation supervenes; the case proceeds slowly; the swelling, smooth and globular, is distinctly defined; the fluctuation is well-marked throughout; and the integuments of the hypochondrium retain their natural softness and mobility.

From *hydatids* of the liver the diagnosis is generally more difficult, but error may commonly be avoided by recollecting that these growths are nearly always situated on the convex surface of the organ, whereas the tumor formed by a distended gall-bladder is usually most prominent below the margins of the ribs. The latter, too, is usually more rapid in its progress, and is generally attended with a more distinct sense of fluctuation.

Cystic tumors of the liver are uncommon, and there are no signs by which they can, with positive certainty, be distinguished from a distended gall-bladder. In all cases of doubt, both in cystic and hydatic formations, a careful inspection should be made of the alvine evacuations; for, if they are pale, white, or clayey, the presumption will be that the deficiency of bile is due to obstruction of the cystic or choledoch duct, and that the tumor in the side is the result of its unnatural accumulation in the gall.

A distended gall-bladder might be confounded with an *aneurism* of the abdominal aorta situated behind the liver; but from this it may generally be easily distinguished by the more gradual development of the tumor, by the absence of pain, pulsation, and bellows-sound, and by the deep jaundice which invariably attends whenever there is permanent obstruction to the emission of bile.

The importance of an accurate diagnosis in this disease is illustrated by the fact that a distended gall-bladder has occasionally been punctured under the supposition that the case was one of abscess of the liver. Such a mistake, which the acute and sagacious Petit once came very near committing, would almost certainly be fatal.

A temporarily distended gall-bladder may relieve itself either spontaneously or under the influence of cholagogue remedies. When the obstruction, however, upon which the accumulation depends is permanent, the case will generally terminate in one of four ways; by rupture of the organ, and the effusion if its contents into the peritoneal cavity, by its adhesion to the intestine and the escape of the fluid in that direction, by the discharge of its contents through the wall of the abdomen, or, finally, by the induction of constitutional irritation.

The surgical *treatment* of this disease is limited to the puncture of the distended organ with a small trocar. But before such a procedure is undertaken the operator should be perfectly satisfied that firm adhesions exist between the tumor and the walls of the abdomen, otherwise, some of the fluid passing into the peritoneal cavity, fatal results might ensue. In cases of doubt the proper plan is to excite adhesions in the same manner as in abscess of the liver. Frerichs mentions an instance in which a tumor of this kind was successfully tapped, about ten ounces of bile flowing off. It formed a very painful, tense, pear-shaped swelling, which pushed out the wall of the abdomen, and extended an inch and a half below the crest of the ilium.

SECT. VIII.—INJURIES AND DISEASES OF THE SPLEEN.

Wounds of the spleen are still more rare than wounds of the liver, which they strictly resemble in their character and in the mode of their production. The prognosis is usually unfavorable, rather on account, however, of the consequent hemorrhage than the severity of the resulting inflammation. When there is a large opening in the side or abdomen, a portion of the spleen may protrude, thus affording an opportunity of ascertaining the true nature of the lesion by direct inspection; but, in general, the only phenomena which the practitioner has to guide him in the formation of his opinion of the case are, the situation of the external wound, the fixed nature of the pain, and the extreme pallor of the countenance, indicative of the great hemorrhage which is so liable to follow such accidents. The absence of symptoms of intestinal, gastric. and other lesions affords important negative evidence.

The *treatment* is to be conducted upon general antiphlogistic principles, of which rest and light diet are among the most important. If there is copious hemorrhage, acetate of lead and opium should be administered in large and sustained doses, aided by the internal and local use of ice. Stimulants are employed warily, lest the reaction be great and sudden, reinviting hemorrhage, or hastening inflammatory development. If the wounded organ protrude, or lie within the edges of the outer opening, prompt replacement is effected; not, however, if, upon examination, it appear that the wound is large, and disposed to bleed much, for, in such a case, it will be much better to let the part remain in its impacted situation than to restore it to the abdominal cavity, thereby favoring profuse effusion from the divided and now unsupported vessels. I am inclined to believe that most of the recoveries after lesions of this kind are due to the partial escape of the organ from the abdomen, and the compression of the wounded structures by the edges of the external orifice. Hence, the circumstance is to be regarded, at least sometimes, rather as a favorable than as an untoward occurrence. If the splenic artery is pierced or severed, the ligature must be employed, even at the risk of greatly enlarging the external wound.

Instances occur in which the spleen protrudes some distance beyond the external wound, in a state of severe inflammation, several days having, perhaps, elapsed since the infliction of the injury. The proper treatment, in such an event, is not to attempt the restoration of the projecting portion, lest it should mortify, or lead to dangerous hemorrhage, but to excise it on a level with the surrounding surface. The propriety of this practice is sanctioned by the report of numerous cases in which it was successfully adopted.

Rupture of the spleen is much more common than wounds of this viscus, and is sometimes produced by the most trifling accidents, especially if there is considerable softening of its substance, as so frequently happens during the progress of intermittent fever. Under such circumstances, indeed, the organ has been known to give way spontaneously, or under the slightest violence, as a blow upon the abdomen, a sudden twist of the body, or straining at stool. The accident is usually fatal in a few hours from the loss of blood, which is often effused in immense quantities, and which no remedies can control. An instance of death from laceration of the splenic vein, caused by severe bodily exertion, in a man, aged 26, has been recorded by Dr. Miling.

Excision of the spleen, on account of chronic enlargement, has been practised, so far as I know, only in two instances, and in both death occurred, apparently from shock, within the first six hours. The operators were Quittenbaum, of Rostock, in 1836, and Küchler, of Darmstadt, in 1855.

SECT. IX.—WOUNDS AND CONTUSIONS OF THE PERITONEUM.

Wounds of the peritoneum do not differ, in regard to their essential attributes, from wounds in other parts of the body. However induced, their danger is due, not so much to the injury inflicted upon this membrane itself as to the mischief sustained by the abdominal muscles and viscera, the latter of which seldom entirely escape in any case. As a general rule, it may be stated, that the probability of a fatal result will be greater, other things being equal, in gunshot, contused, and lacerated wounds of the peritoneum than in the simple incised, unless they are of extraordinary extent, as happens, for example, in practising the large incision in ovariotomy, the mortality from which is sufficiently great.

Mere contusions of the peritoneum sometimes induce violent and even fatal inflammation, especially in elderly, broken-down subjects. Such accidents are most liable to be produced by falls, blows, kicks, and similar injuries; but they may also be caused by partially spent cannon balls and pieces of shell, by the passage of the wheel of a carriage, and by the body being forcibly compressed between the buffers of a railway car. Lesions of this description are often complicated with similar lesions of the abdominal muscles and viscera, along with extensive extravasations of blood, both external and internal, and yet the most careful inspection may fail to discover any external marks of mischief, the integuments having safely glided away from the vulnerating body.

Laceration of the peritoneum, more or less grave in its character, may be caused by external injury, as blows or falls. It has also been known to be produced in leaping and during the violent throes of parturition. In old, decrepit subjects, laboring under habitual constipation, the serous covering of the intestines occasionally gives way during defecation, as in the interesting cases observed by Rostan in the old women at La Salpêtrière at Paris. A similar effect sometimes ensues from a twist of the bowel, mechanically interfering with the transmission of its contents.

A case has been reported by Dr. Derner, of a hussar, who, in consequence of a violent leap of his horse, received a rent in the omentum, one inch and a half long. He died early the next morning, when five ounces of blood were found in the peritoneal cavity.

Laceration of the peritoneum, unless extensive, or complicated with serious lesion of other structures, is not, in general, to be regarded as very dangerous, as it usually readily yields to appropriate treatment. When the accident is accompanied, as it occasionally is, by profuse hemorrhage, consequent upon the rupture of a large vessel, it may, of course, terminate fatally, perhaps promptly, and even without an effort at reaction, the patient looking ghastly pale, and the abdominal cavity being filled with blood. It has been asserted that a wound or rent of the peritoneum may lead to fatal hemorrhage, but such a statement is not borne out by facts, as any one may satisfy himself by taking into view the small size and great paucity of the vessels of this membrane.

All traumatic affections of the peritoneum must necessarily be followed by a certain degree of inflammation of its substance. This may be just sufficient to enable nature to effect the work of repair, or it may be so severe as to cause death. In the latter case, the symptoms denotive of the existence of the disease will generally be unmistakable. The patient lies upon his back, and retracts his limbs, in order to relieve the tension of the abdominal muscles; great pain and tenderness, at first circumscribed, and afterwards diffused, exist; the breathing is hurried, short, and thoracic; the pulse is frequent, small, hard, and wiry; the bowels are constipated; the stomach is nauseated, and rejects its contents, not by vomiting but by regurgitation; the eyebrows are knit, and the whole countenance is expressive of great suffering; the thirst and restlessness are intense; and there is usually considerable fever, often preceded by violent rigors. Death generally occurs in from thirty-six to forty-eight hours.

If copious hemorrhage accompanies the lesion, there will be, in addition to some or all of the other symptoms, deadly pallor of the countenance, great feebleness of pulse, and the most distressing prostration, with excessive thirst and intense precordial anxiety.

The symptoms of these various affections will generally serve as a sufficient index to their *treatment.* The great points to be attended to are the removal of foreign bodies, and the prevention of undue inflammation, not only of the peritoneum but also of the other structures. If the patient is strong and robust, blood is freely taken from the arm and by leeches from the abdomen; the bowels are confined by the liberal use of opium; and recourse is had, if need be, to fomentations and blisters. Purgatives are carefully abstained from. Calomel may sometimes be advantageously administered, but in general it is best to dispense with its use. If marked prostration exist, stimulants, as wine and brandy, with ammonia or quinine, may be necessary from the commencement. Gastric irritability is allayed by sinapisms, ice, and effervescing draughts.

SECT. X.—WOUNDS AND CONTUSIONS OF THE WALLS OF THE ABDOMEN.

Wounds of the muscular walls of the abdomen are, like similar injuries elsewhere, of various kinds, as incised, punctured, lacerated, contused, gunshot, and poisoned. In character they may be simple or complicated; in extent superficial or deep, small or large; in direction, horizontal, oblique, or vertical. Exhibiting no symptomatological peculiarities worthy of special notice, these different classes of wounds are often of a grave nature, liable to be followed by the worst consequences. Thus, there may be profuse hemorrhage, extensive laceration of the peritoneum, or violent contusion of some of the abdominal viscera, putting life in jeopardy, either immediately or remotely, by shock, exhaustion, or inflammation.

Among the more terrible lesions of this description are buffer accidents, as they are termed, produced by the body being tightly jammed between the buffers of two railway cars. In these accidents the internal viscera, both hollow and solid, are often frightfully contused, lacerated, and even pulpified, without any wounds whatever of the muscular walls of the abdomen. The collapse is generally most appalling, and the majority of the patients sink in a few hours, or, at most, in a few days, after the receipt of the injury, without a successful attempt at reaction.

Severe suffering and even death sometimes follow the slighter forms of contusions of the walls of the abdomen, either from concomitant injury to the peritoneum or to this membrane and the internal viscera. If the patient does not perish from the immediate effects of the resulting inflammation, his life may be placed in jeopardy secondarily, by the formation of intermuscular abscesses, which, besides being tedious, are always excessively painful, and productive of great constitutional irritation. In persons of feeble, broken-down health, the most trifling contusion of the abdomen will occasionally give rise to the most extensive abscesses, which no treatment, however judiciously directed, can successfully combat.

The bleeding attendant upon wounds of the abdomen proceeds from various sources, according to the region in which they are situated. In general, it is derived from the epigastric, mammary, circumflex, and lumbar arteries, or some of their principal branches. Usually small and easily controlled, it is occasionally exceedingly profuse and arrested with great difficulty. If the wound is of a valvular form, a large quantity of blood may accumulate immediately beneath the skin, or in the cellular tissue beneath the muscles; forming, in the one case, a diffused bluish swelling, in the other, a hard, circumscribed tumor. Or, the blood, instead of collecting externally, may escape into the peritoneal cavity, thus constituting a very dangerous, because a concealed, bleeding. In the latter case, the nature of the hemorrhage will be indicated by a ghastly pallor of the countenance, by cold, clammy sweats, and by great feebleness of the pulse, along with frequent sighing, intense thirst, and excessive restlessness. If the quantity of blood poured out be considerable, it may, as the fluid always has a tendency to gravitate to the lower part of the belly, produce sensible enlargement of the hypogastric region, soft at first, and solid afterwards. Sometimes the hemorrhage is strictly internal, proceeding from a wound of one of the visceral arteries, or, it may be, from one of the large vessels of the abdomen. Such an occurrence is always fraught with danger and perplexity.

Incised wounds of the abdomen, other things being equal, bleed less than lacerated and contused wounds. Punctured wounds sometimes bleed profusely, and the same remark applies not less forcibly to gunshot wounds. In the latter, it sometimes comes on secondarily, that is, from the fifth to the eighth day after the infliction of the injury.

However the bleeding may be induced, or from whatever source it may emanate, the only way to arrest it is to ligate the affected vessel, unless, as may occasionally happen, it is situated favorably for compression; in which case the best instrument for the purpose would be an ordinary truss, the pad of which should be placed directly over the divided parts. When the bleeding is internal, the outer wound should promptly be enlarged, and the artery secured by ligature.

Muscular wounds of the abdomen must always be treated with the interrupted suture, carried down to within a very short distance of the peritoneum, but, of course, not into it. A very firm hold should be taken of the edges of the breach, otherwise, as the connective tissue is both soft and scanty, the thread will be sure to tear itself out long before the completion of the consolidating process. Moreover, the stitches should be placed very closely together. During the subsequent treatment great attention should be paid to position, in order to keep the parts fully relaxed; and, after the patient begins to walk about, the abdomen should be well supported for many months, with a broad gum-elastic bandage, provided with a flat pad. Unless these precautions be properly attended to, ventral hernia will be inevitable.

SECT. XI.—GUNSHOT INJURIES OF THE ABDOMEN.

Gunshot wounds of the abdomen offer few peculiarities apart from those of ordinary injuries. When the missile penetrates the muscular walls of this cavity it generally inflicts irreparable mischief, even when it does not enter any important viscus, simply by exciting violent inflammation of the peritoneum. Indeed, fatal disease of this membrane is not unfrequently induced by the contusion merely which it experiences from the blow of a ball or shell, without any actual wound of its substance. Gunshot lesions of the stomach, intestines, spleen, liver, gall-bladder, kidneys and bladder, are nearly always fatal, death being caused either by shock, by shock and hemorrhage, by hemorrhage alone, or by inflammation usually supervening within a few hours after the accident, and rapidly tending to destruction, despite the best-directed efforts of the surgeon. In order to exhibit the nature and effects of these lesions in a more tangible light, I shall subjoin here, in a modified tabular form, the returns of the wounded, as given in the Medical and Surgical History of the British army, in the Crimea.

		Cases.	Deaths.	Discharged.	Invalided.
1. Simple flesh wounds and contusions	Slight	43		43	
	Severe	72	18	37	24
2. Penetrating the abdomen and lodging, with lesion	Not accurately known	14	13		1
	Of peritoneum only	3	3		
	Of viscera	101	95	1	5
3. Rupture of viscera without external wound		4	4		
4. Fracture of pelvic bones without penetration of the abdomen		29	16	5	8
Total		266	149	86	38

Of the above cases there were 23 in which the missile lodged, with a mortality of 21, and 68 in which it did not lodge, with a mortality of 60. Thus, it will be perceived that, in gunshot wounds of the abdomen, with penetration of its cavity, death was the rule, and recovery the rare exception. The cause of death in these cases was usually shock, with or without hemorrhage, and the great majority expired within the first twenty-four hours after the receipt of the injury. A very small proportion of the cases perished from peritonitis.

It not unfrequently happened in the above cases that several viscera were wounded by the same missile. "Thus, in one instance, the liver, spleen, and pancreas were injured by the same bullet; in another the liver and kidneys; in another the pancreas, stomach, and colon; in many the small intestines and urinary bladder, the men having been shot from above." In a soldier of the 19th regiment, a musket-ball entered near the umbilicus and issued near the sacrum, perforating the small bowel at sixteen points, the man being at the moment in the act of defecation. He survived his wounds nineteen hours.

Of 37 cases of penetrating gunshot wounds of the abdomen, reported by Alcock, Legouest, and Menière, only one was saved. Of 38 cases that occurred in the Indian wars 32 died and 6 recovered. In the expedition against Constantine every one that was thus injured perished, and the same bad luck attended those that were wounded at the siege of Moultan.

Gunshot lesions of the walls of the abdomen present the same characters as similar injuries in other muscular regions. Erysipelas is a common effect, and they are occasionally followed by tedious abscesses, the matter forming in the track of the missile and producing, if not speedily evacuated, extensive havoc among the surrounding structures.

Of the symptoms, diagnosis and treatment of these accidents nothing need be said here, as these topics are fully discussed in some of the preceding sections.

SECT. XII.—ABSCESSES WITHIN THE WALLS AND CAVITY OF THE ABDOMEN.

Parietal Abscess.—It is not often that abscesses form in the walls of the abdomen. The occurrence is chiefly witnessed as a result of external injury, as a blow or kick, but it is also occasionally noticed as a consequence of inflammation of the bowel from the presence of impacted feces, or of a foreign body. However induced, the symptoms are usually well marked, being such as attend acute inflammation in other parts of the body, only that there are generally more pain and constitutional disturbance. The matter may collect, first, immediately beneath the skin, in the cellulo-adipose substance; secondly, between the layers of the different muscles; and, thirdly, between the muscles and the peritoneum. In the latter case, it is usually of a decidedly stercoraceous odor, owing to the imbibition of sulphuretted hydrogen from the intestinal tube, which is very apt, as the disease advances, to become adherent to the posterior wall of the abscess. This event often happens even when the bowel retains its integrity, as, indeed, it generally does, however extensive may be the accumulation, its tendency being always to the external surface. Owing, however, to the manner in which the pus is bound down by the muscles and aponeuroses it is a long time in coming to a head.

The *diagnosis* of these deep-seated abscesses is sometimes extremely obscure, especially in their earlier stages. The most reliable phenomena are, the occur-fruit-stone, nail, shot, bristle, worm, inspissated mucus, or calculous concretion. Sometimes the obstruction is occasioned by indurated feces, dry, brittle, and, perhaps, incrusted with carbonate and phosphate of lime. Whatever its character may be, it is sure, if long retained, to excite irritation and ulceration in the coats of the appendix, followed by adhesions, and ultimately, if the morbid action is not checked, by the development of a stercoraceous abscess, opening either externally, into the peritoneum, or into some neighboring coil of intestine.

The pus attending the formation of an abscess of this kind is generally of an ill-elaborated character, and excessively fetid, owing either to the absorption of sulphuretted hydrogen from the alimentary canal, or the actual admixture of fecal matter, which sometimes escapes in large quantities.

The disease, although most common from the age of twenty to that of forty, is often met with at an early period. Males are much more subject to it than females.

The *symptoms* of stercoraceous abscess are always well marked, being invariably such as characterize the development of phlegmonous abscess in other parts of the body. The local distress, however, is generally more than ordinarily severe, owing to the resistance which the accumulating pus encounters from the surrounding structures. Great constitutional disturbance is present; the rigors are violent and protracted, and the patient is harassed with gastric irritability, want of sleep, and a sense of excessive prostration. As the matter advances, the integuments are elevated into a distinct tumor, exquisitely tender to the touch, and marked by an erysipelatous blush, with an appearance of œdema, both so characteristic of deep-seated abscess. Owing to the manner in which the fluid is bound down, it is seldom possible to detect fluctuation until after the disease has committed severe, if not irreparable, mischief. In some cases air passes from the bowel into the abscess, where its presence may readily be detected both by the ear and the finger, the part, on percussion, emitting a peculiar tympanitic sound.

The proper *treatment* of this affection is an early and free incision; for, unless the case is met in this way, the matter will be sure to burrow more or less extensively, and may even find vent by the bowel, thus eventually causing a stercoraceous fistule, since, notwithstanding this occurrence, the abscess will ultimately also discharge itself externally. Before the operation is performed, the nature of the disease should always be carefully explained to the patient and his friends, lest, gas and pus escaping, the surgeon should be accused of having wounded the bowel, when the opening has been made by the pressure of the pus, or the ulceration which preceded and caused the abscess.

Splenic Abscess.—Abscess of the spleen should be treated upon the same principles as that of the liver. Of this rare disease I have seen only one case, the patient being a young, robust farmer, who suffered immensely for a forthight. The spleen gradually augmented in volume, and, at the expiration of this period, it projected over towards the umbilicus, forming a large, rounded tumor, between the linea alba and the margin of the ribs. In a short time fluctuation was perceived, and, on introducing a trocar, about three pints of fetid, dark-colored matter issued from the incision. The wound was kept open for several days, by means of a tent; but it soon closed, and, thence on, the patient's health began gradually to improve. The disease had supervened upon repeated attacks of intermittent fever, and was characterized by excessive irritability of the stomach, great pain and tenderness, and an impending sense of suffocation, caused, no doubt, by the pressure of the enlarged organ upon the diaphragm.

Ileo-Pelvic Abscess.—Finally, there is a form of abscess which occasionally supervenes upon parturition, coming on within the first fortnight after delivery, in consequence of inflammation of the uterus. It differs from the more ordinary abscess in the iliac region in that the matter is situated lower down towards the anterior superior spinous process of the ilium, or even in the ilio-inguinal region, the fluid extending, perhaps, slightly beneath Poupart's ligament. Very frequently, indeed, the matter is strictly lodged in the pelvis, its starting-point being, probably, the broad ligaments of the uterus, the ovary, or the retro-perifatal results. The signs of distinction are generally sufficiently clear. In enlargement of the gall-bladder, the tumor is globular, uniformly hard, and situated lower down than in hepatic abscess; in which the swelling is more diffused, more painful, and also more soft, generally fluctuating at its summit, while at the base it is firm and resisting.

4th. The puncture in hepatic abscess should not be direct, but valvular, so as to exclude the ingress of the air, the presence of which is always a source of severe irritation by causing rapid decomposition of the pus. To obviate this effect, the operation should be performed in the same cautious manner as in paracentesis of the chest, with a trocar having a canula furnished with a stopcock and a bladder. The only exception to this rule is where the matter lies just below the skin, ready at any moment to discharge itself.

Biliary Abscess.—Abscesses of the gall-bladder opening outwardly are uncommon. Their exciting cause is usually external injury, or some mechanical obstruction to the evacuation of the bile, which thus, in consequence of its irritating properties, sets up inflammation, terminating in suppuration. As the case progresses, adhesions form between the affected organ and the walls of the abdomen, and these, in turn, are succeeded by ulcerative action, and the discharge of the matter.

The manner in which such an abscess is developed is usually very insidious; and, as to its diagnostics, they are altogether unreliable. The affections which it is most liable to simulate are abscess, hydatids, and serous cysts of the liver, and from these it is seldom in the power of the surgeon to distinguish it until he meets with the characteristic discharge; that is, bile mixed with pus, or pus and gall-stones. Deep jaundice, gastric irritability, clayey stools, and high-colored urine are prominent symptoms in the latter stages of the complaint. The abscess generally points in the lower part of the hypochondrium, but a long time commonly elapses before it reaches the surface. In some cases, the matter persues a very long and devious route before it finds an outlet. Its approach is always preceded by great pain and tenderness, and by an erysipelatous appearance of the integuments.

Gall-stones sometimes pass off by these abscesses, occasionally in large numbers, followed by a good recovery, as in a case which I saw, along with my friend Professor Miller, of Louisville. The patient, a lady, aged forty-one, had suffered for several years from severe pain in the right hypochondrium, with inability to lie on either side, but especially the left. After some time a hard, circumscribed swelling, about the size of an egg, appeared at the most tender part, and, at length, terminated in an abscess, which, breaking externally, gave exit, at various intervals, altogether to thirty-six biliary concretions, of a tetrahedral figure, perfectly smooth, of a dark cinnamon color, and about the volume of an ordinary cherry. The mouth of the abscess was situated on a level with the umbilicus, five inches from the middle line. In a case more recently under my observation, nine calculi, the largest upwards of half an inch in diameter, were discharged from an abscess in the right side, the patient, a woman, thirty-eight years of age, making an excellent recovery.

The *treatment* of biliary abscess must, in the first place, be rigidly antiphlogistic, precisely as in abscess of the liver. Surgical interference should be refrained from until the matter fairly points, or until there is reason to believe, from the character of the local symptoms, that firm adhesions have formed between the gall-bladder and the walls of the abdomen. If this precaution is neglected, the fluid may pass into the peritoneal cavity, and thus provoke fatal inflammation.

Stercoraceous Abscess.—This variety of abscess, which, as the name implies, is connected with the intestinal tube, may occur in any portion of the abdomen, but is most common in the right iliac region, from disease of the colon, cæcum, or vermiform appendix, brought on by the abuse of purgatives, the impaction of foreign bodies, or external injury. Cases occur in which it is due to perforative ulceration of the bowel, as a result of typhoid fever; but the most common cause of all is the lodgement of an extraneous substance in the cæcal appendix, as a which were very much stretched and attenuated, its posterior boundary being formed by the transverse fascia, from which it was obliged to be separated with great care. Its chief supply of blood was derived from a branch of the superficial epigastric artery, which was enlarged and required a ligature. Under the microscope the tumor exhibited all the characteristics of fibro-plastic tissue, interspersed with colloid masses, of variable size, and of an irregularly oval shape, their contents being, for the most part, composed of granular matter. The recovery from the operation was rapid, and, thus far, there has been no tendency to relapse.

The *cystic* tumor of the walls of the abdomen is very uncommon. In most of the cases that have hitherto been observed, it was deep-seated, lying immediately exterior to the peritoneum. It fluctuates, though usually rather faintly, under pressure, and is capable of attaining so large a bulk as to simulate ascites, or ovarian dropsy. Its contents are of a serous nature. Its progress is very slow and painless, and the patient's health is commonly excellent. These circumstances will generally serve to distinguish this morbid growth from others of a more solid character, but, should any doubt exist upon the subject, it will promptly be dispelled by the use of the exploring needle. An instance in which three immense cystic tumors existed simultaneously in the walls of the abdomen, has been related by Dr. Scott in the eleventh volume of the London Medical Gazette.

In the *diagnosis* of tumors of the walls of the abdomen, much valuable information may be derived from a careful consideration of the history of the case, and a thorough examination of the parts, the bowels having been freely evacuated a short time previously. The patient should lie upon his back, with his limbs well retracted, and the shoulders elevated, so as to cause complete relaxation of the abdominal muscles. The tumor being now grasped with one hand, the fingers of the other may generally be readily insinuated beneath it if it be situated in the abdominal walls, at the same time that it will convey an idea of fixedness, which does not belong to intra-peritoneal growths. If the patient turns upon his side, the tumor will steadily maintain its position; generally, too, there will be a degree of tension in the parts which is altogether foreign to internal formations and enlargements. In the intra-peritoneal tumor, no matter what may be its character, the growth is originally loose, usually moving or floating about when the patient changes his position in bed; in the intra-parietal, on the contrary, it is fixed. A growth situated in front of the muscles of the abdomen becomes more prominent when these muscles actively contract; no change is produced by this cause when the tumor is developed in the substance of the muscles; when the morbid mass lies behind the muscles, it is forced backwards at each effort, and thereby rendered less distinct. When a tumor follows all the motions of the walls of the abdomen, whether dependent upon respiration, pressure, or traction, the presumption is that it was developed there, but when it does not obey them, the probability is that it is situated behind them, or, what is the same thing, that it has no connection with them. The diagnosis between a tumor and an abscess is readily determined by the history of the case, and the absence or presence of inflammatory symptoms. Should any doubt exist in regard to the precise position of the morbid growth, and an operation be urgently demanded, an exploratory incision will be the only thing likely to clear up the difficulty.

In the *extirpation* of tumors in this situation, the incision should always be made as much as possible in the direction of the muscular fibres of the abdomen; free use should be made of the grooved director; all bleeding vessels should be tied as soon as they are divided; and unusual pains should be taken to tack together, first, the muscular edges of the wound, and afterwards the integumental, lest, when the parts are healed, hernia should take place. The abdomen should be well protected with long, broad adhesive strips, a compress and a broad bandage, which, when the patient is about to rise, should be replaced by an elastic supporter. By observing these precautions all danger of visceral protrusion will be effectually obviated, however large may have been the wound.

When the tumor is cystic, the best plan is to evacuate its contents by a free incision, and then mop its inner surface thoroughly with dilute tincture of iodine.

Professor Nélaton, in 1862, described with great accuracy what he calls the fibrous tumor of the *iliac fossa*, a growth which, so far as I recollect, I have never met with in this situation. It usually occurs in young married women, closely resembles in its structure the fibrous tumor of the uterus, and is situated just above Poupart's ligament, near the antero-superior spinous process, where it is generally, if not invariably, connected by a fibrous band to the iliac bone. It is solitary, hard, elastic, tardy in its progress, and easily pushed a little upwards and backwards but not downwards or inwards. In volume it varies from that of a fist to that of a fœtal head. The accompanying pain is of a lancinating character, and extends about in different directions, especially down the thigh and leg. The skin retains its natural color and consistence. The tumor is developed in the cellular tissue between the peritoneum and the iliac fascia.

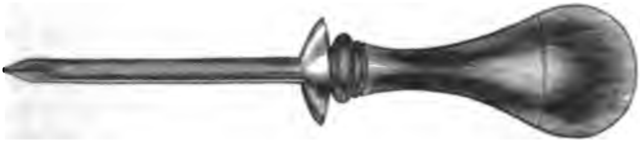
In examining such a tumor care should be taken not to confound it with an enchondroma of the iliac bone, a fibrous tumor of the uterus, a collection of feces, a glandular enlargement of the groin, or a tertiary syphilitic tumor in the wall of the abdomen. Its most important characteristics are its remarkable firmness, the fact that it is always solitary, its great depth and fixedness in the iliac region, the lancinating nature of the pain, its slow growth and small size, and, finally, the absence of œdema and discoloration of the skin. The general health commonly remains sound.

If the tumor is small, free from pain, and slow of growth, it should be let alone ; otherwise it may be removed, care being taken, in laying it bare, not to wound the peritoneum and the iliac vessels. The incisions should be made in the direction of Poupart's ligament.

SECT. XIV.—ASCITES AND TAPPING OF THE ABDOMEN.

Tapping of the abdomen is required for the removal of dropsical accumulations of the peritoneum and the ovary. As it is, in general, intended merely as a palliative measure, it is never resorted to until the quantity of fluid is so considerable as to occasion great local inconvenience and serious embarrassment of respiration. It may be performed at various points, but the most eligible one is the linea alba, midway between the pubes and the navel. The only objection to puncturing the abdomen here is the danger of perforating the urinary bladder, which, when distended, often rises some distance above the pelvis. Any mischief, however, that might be thus induced will be effectually obviated by previous evacuation of the organ. In encysted dropsy, it may be necessary to make the opening at the side of the abdomen; but in doing this there is danger of wounding the epigastric artery, an accident occasionally followed by fatal results. In ordinary dropsy, the intestines are pushed back by the weight of the fluid, beyond the reach of the trocar. It is only when they have contracted adhesions to the anterior wall of the abdomen, as might happen when the operation has been repeatedly performed at the same place, that they would be at all likely to suffer. The fluid of ascites may sometimes be safely and expeditiously evacuated by puncturing the navel or the sac of an old umbilical hernia.

Fig. 445.

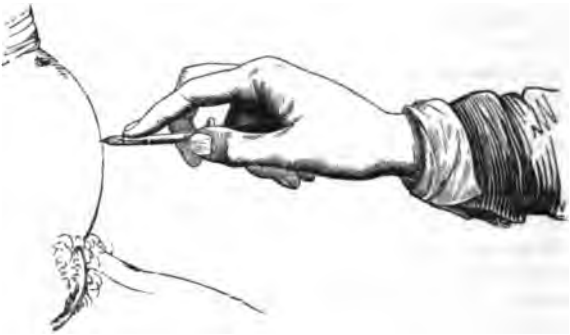


Trocar.

The only instrument required for this operation is a medium-sized cylindrical trocar, which I greatly prefer to the flat. Some surgeons use a thumb-lancet or bistoury and a catheter, but the operation thus performed, while it really possesses no advantage whatever over the other, is always more painful and tedious. There should be at hand, in addition to the trocar, a broad flannel, muslin, or linen bandage, split at the ends, for swathing the belly, and several basins for receiving the water.

The patient sits semi-erect in bed with his feet on a chair, or, what is generally preferable, especially if he is weak, he lies on his side near the edge of the bed, and the abdomen is surrounded by the bandage, the ends of which are crossed behind, and given in charge of two assistants. Holding the trocar firmly in the right hand, with the thumb and index-finger resting upon the canula, the surgeon plunges it into the linea alba, about three inches above the pubes, and, by a steady, forcible pressure, pushes it through the abdominal walls. A sudden cessation of resistance and the escape of a few drops of fluid announce the arrival of the instrument in the peritoneal cavity, and serve as a signal for the withdrawal of the trocar. The water issues in a full stream, and the discharge is usually completed in a few minutes. To prevent syncope, so apt to follow the rapid removal of the pressure of the accumulated fluid, the ends of the bandage are gradually tightened by the assistants, which compensates, in some degree, for the loss of support experienced by the diaphragm, the large vessels, and the abdominal viscera. Occasionally the passage of water is interrupted by the intrusion of a piece of omentum, a hydatid, or a mass of lymph within the canula. When this happens, the obstacle should be removed by a director, a large probe, or a female catheter, the latter of which may sometimes be advantageously retained in the abdomen until the discharge is completed. When the operation is over, the canula is carefully withdrawn, and the puncture is closed by adhesive strips, the ends of the roller being pinned firmly over a thick napkin, to afford due support to the parts, and to prevent rapid reaccumulation.

Fig. 446.



Operation of tapping the abdomen.

The only *accidents* at all likely to happen in this operation are syncope and hemorrhage. Of these, the first is to be prevented by a proper tightening of the bandage, in proportion as the water is evacuated, and the second, by making the puncture at the linea alba, where there is no important vessel. It is possible that a copious hemorrhage may occasionally proceed from injury of one of the arteries of the omentum; but such an occurrence must be very rare, and does not, of course, admit of any remedy, since the true nature of the case will seldom be revealed until after death. Should the epigastric artery be wounded, and the blood issue externally, the opening made by the trocar should be plugged with a bougie, or piece of wood, wrapped with linen. This expedient failing, the vessel is exposed, and included in a ligature.

When the surgeon is called upon to tap a female, especially a young, unmarried one, or one whose husband has long been absent, he should not be too eager to enter upon the undertaking, but assure himself well beforehand that the patient is not laboring under pregnancy, instead of ascites. For want of this precaution, accidents have often occurred, as ludicrous as they were disreputable. The best way to avoid this "dry tapping," as it has been not inaptly termed, is to institute a careful examination into the condition of the mouth and neck of the uterus, if not also of the nipple, and to auscultate the abdomen, with a view to the detection of the fœtal and placental sounds. This precaution will be more particularly necessary, if the patient is in excellent health, and has, withal, a ruddy complexion, phenomena which are never present in well-established ascites. If pregnancy exist, the hand, plunged into cold water, and suddenly applied to the tumor, will generally cause instantaneous motion of the child, thus at once revealing the true nature of the case. The distinction between abdominal and ovarian dropsy will receive special attention in the chapter on the diseases of the female genital organs.

SECT. XV.—FISTULES OF THE ABDOMEN.

The abdomen is liable to different kinds of fistules, of which the principal are the gastric, intestinal, and biliary. Generally caused by wounds, ulceration, or gangrene, they give rise to various accidents, and always heal with great difficulty; indeed, in many cases, they effectually resist every method of treatment that has yet been devised for their relief.

1. *Gastric Fistule.*—A gastric fistule generally occupies the epigastric region, and is, consequently, always very short. Although various kinds of injury may produce it, the more severe and unmanageable forms are usually the result of gunshot wounds, attended with more or less loss of substance of the muscular structure of the abdomen. In the case of Alexis St. Martin, the fistule was occasioned by a charge of buckshot, which, tearing away the integument at the inferior part of the left side of the chest, opened the pleural cavity, and entered the great cul-de-sac of the stomach through the diaphragm. The immense gap thus made gradually cicatrized, but left a permanent opening, about four-fifths of an inch in diameter, which is usually closed by a circular fold of protruding mucous membrane. Upon pushing back this valve-like fold, the contents of the stomach may readily be extracted for examination.

A fistule of the stomach is, in general, easily distinguished by its situation, and by the nature of its discharges, consisting of mucus, gastric juice, and various kinds of ingesta. Flatulence and dyspepsia are usually present in greater or less degree.

A gastric fistule, caused by organic disease of the stomach, is, of course, incurable; and a similar remark is applicable to all attacks of this kind, accompanied with great loss of substance. Closure, on the contrary, may reasonably be hoped for when the sinus is very small; for then restoration is sometimes effected spontaneously, or under very simple treatment. The most appropriate local remedies, apart from cleanliness, are stimulating injections, and occasional cauterization with nitrate of silver. Little, if, indeed, any benefit, is to be expected from refreshing the edges of the breech, and approximating them by suture. Special attention should be paid to the patient's diet and the condition of his system. When, in consequence of extraordinary loss of substance, the case is irremediable, the parts should be made as comfortable as possible by means of a suitable obturator. St. Martin, whom I saw upwards of twenty-five years after his accident, had all along enjoyed excellent health, and really did not seem, at the time referred to, to experience any material inconvenience.

2. *Biliary Fistule.*—Biliary fistule is usually caused by ulceration of the gall-bladder, leading to adhesion between this reservoir and the wall of the abdomen, the primary disease itself being produced either by ordinary inflammation, or by obstruction of the cystic duct by inspissated bile, a biliary concretion, or the pressure of some tumor. A similar effect may be occasioned by an abscess of the liver opening externally, or by gunshot and other wounds of this organ.

The most common situation of the fistule is the right hypochondriac region, but cases occur, although they are rare, in which it is found lower down or farther in towards the middle line. Its course is generally somewhat devious, and its diameter so small as hardly to admit a common-sized quill, especially if some time has elapsed since its formation.

The discharge from a biliary fistule consists either of pure bile, or of bile mixed with pus and mucus, the quantity in the twenty-four hours varying from a few drops to several drachms, according to the size of the sinus. Sometimes a probe may readily be passed along the abnormal passage into the gall-bladder or into a hepatic abscess. The general health is usually a good deal disordered, the patient being sallow, flatulent, dyspeptic, constipated, and colicky.

In a case which I recently attended with Dr. S. C. Sharp, of Kensington, the patient, a woman aged forty-eight, had labored under a biliary fistule for nearly five years. It had been caused by a large hepatic abscess, followed by the discharge of seventeen calculi, varying in size from a pea to that of a horse-chestnut, with a smooth surface, and of an irregular, triangular shape. Their composition was chiefly cholesterine. Mucus and pus, mixed with bile, continued to flow from the side for upwards of four years, when the discharge materially diminished, but the pain and distress greatly increased. A probe inserted into the sinus readily detected two concretions, which I removed by enlarging the passage with a blunt-pointed bistoury. They were each about the size of a small nutmeg, of the same appearance as the other, and situated in a pouch two inches and a half below the surface. No untoward symptoms followed the operation, and the case, when last heard from, was progressing favorably.

In the *treatment* of this affection little benefit is to be expected from topical means. Now and then a spontaneous cure takes place, but the great majority of instances remain unrelieved until the patient is either worn out by the concomitant irritation, or dies of some intercurrent disease, perhaps years after the appearance of the fistule. All cases depending upon permanent obstruction of the cystic duct must necessarily be of this nature. Any plastic operation would, of course, be utterly futile; for, independently of the impossibility of reaching the bottom of the abnormal passage, the constant exit of bile would inevitably be fatal to the adhesive process. Should gall-stones appear in the fistulous track, they must be promptly extracted.

3. *Intestinal Fistule.*—Intestinal fistule, generally, but improperly, termed artificial or abnormal anus, is usually the result of gangrene of the bowel from the pressure exerted upon it by the stricture in strangulated hernia. It may also follow upon a wound of the bowel, and upon stercoraceous abscess. However produced, it is most frequently met with in the inguinal, scrotal, and femoral regions, in connection with the small bowel. A bad form of fistule occasionally arises from ulceration of the cæcum or vermiform appendix.

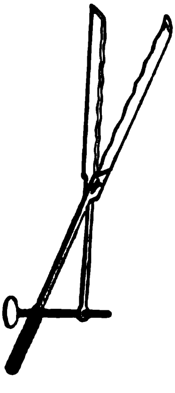
In the fistule caused by mortification, consequent upon strangulated hernia, the two ends of the bowel lie in immediate contact with each other, in the bottom of the sac, like the tubes of a double-barrel gun, their junction being formed by their contiguous walls, each, of course, consisting of four layers. During the inflammation which precedes the sloughing process, the outer or serous surfaces become firmly adherent, not only to each other, but also to the edges of the opening in the abdomen; hence, when the bowel gives way, there is no danger of fecal extravasation into the peritoneal cavity. The junction of the two cylinders here referred to forms a kind of angular, spur-like process, ridge, or buttress, which opposes an effectual obstacle to the passage of the contents of the upper portion of the bowel into the lower, which, in consequence, soon becomes empty and collapsed. As the patient has no control over his feces, they have an incessant tendency to escape, thus not only irritating and annoying him, but, what is worse, rendering him an object of disgust alike to himself and to all around. Moreover, he ordinarily suffers from prolapse of the mucous membrane of the gut, more especially of the superior extremity, and, if the opening happens to be situated high up in the canal, there is danger that his general health may become seriously affected from the want of proper nourishment, in consequence of the premature escape of the ingesta. Flatulence, pain, and indigestion are also common attendants upon intestinal fistule. It is proper to add that the ridge between the two cylinders is usually much less distinct when the accident supervenes upon a wound of the bowel, or a stercoraceous abscess, than when it is caused by mortification.

The opening in the wall of the abdomen, in which the ends of the bowel lie, is of variable diameter, shape, and depth, and is encircled by thick, irregular edges, generally more or less everted, or everted at one point and inverted at another. The surface immediately around, from the constant contact of fecal matter, bile, and mucus, is usually red, inflamed, chapped, or ulcerated, and so tender as to cause considerable suffering. At the bottom of the opening the two extremities of the bowel are closely embraced by a kind of membranous pouch, technically termed the infundibulum or funnel, of a firm, dense structure, from one to two lines in thickness, and formed by a prolongation of the proper hernial sac.

The *treatment* of intestinal fistule, occasioned by strangulated hernia, naturally divides itself into palliative and radical. The first consists in promoting the comfort of the patient, by strict attention to cleanliness, preventing the too early escape of the ingesta, and combating such accidents or complications as are liable to arise during the progress of the disease. The use of a well-adjusted truss, furnished with a broad pad to maintain equable pressure upon the parts, will not only afford great comfort, but may occasionally, especially if the spur-like process between the two cylinders is not too large or prominent, even effect a radical cure. When the case is irremediable, or unusually troublesome, a receptacle, made of gutta-percha lined with silver, must be worn, the vessel being frequently emptied and cleaned.

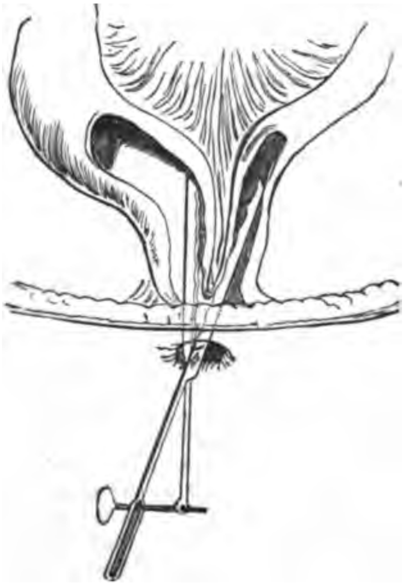
The radical cure may be attempted in one of two ways; either by means of the seton, as originally suggested by Physick and Schmalkalken, or with the enterotome, as practised by Dupuytren. The object of both is to destroy the spur-like process between the two intestinal cylinders, so as to re-establish the natural route of the feces, and, when this is accomplished, the closure and cicatrization of the abnormal opening soon follow. The seton, which is best adapted to the milder forms of the affection, may consist of a piece of narrow braid or a stout gum-elastic thread, introduced with a short, curved needle mounted upon

Fig. 447.



Dupuytren's enterotome.

Fig. 448.



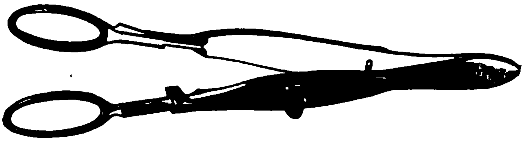
Enterotome applied.

a handle. It should be carried to a considerable height, in through one tube and out at the other, and be retained for several weeks, or until there is reason to believe that there is firm union between the two cylinders, when all that portion of the septum lying below the foreign body is cut away.

The enterotome, fig. 447, consists of two serrated blades, a male and a female, about six inches in length, united by a movable pivot, and brought together by a screw passed through the ends of the handles. Fig. 448 exhibits the application of the instrument to the spur-like process formed by the junction of the two cylinders, one blade being inserted into the upper, and the other into the lower, cylinder. Great care must be taken that the pressure in the first instance is not too firm, otherwise very serious suffering, if not death, may result. The proper plan is to tighten it gradually from day to day, until it has cut its way effectually through the septum. If, notwithstanding this, the patient experience much pain, free use should be made of anodynes, strict watch being kept all the while upon the peritoneum. Moreover, it will always be well, before commencing such an operation, to subject the patient to a certain degree of preparatory treatment, in order that he may be the better able to bear up under its effects. The instrument may usually be taken off in from six to eight days.

The adjoining cut, fig. 449, exhibits an enterotome which I devised many years ago, while treating a case of artificial anus consequent upon a wound of the small bowel. It fulfilled the indication most admirably. It is much lighter and smaller than that of Dupuytren, while the pressure which it is capable of exerting is very great. It consists of two blades, brought together by a strong slide, and terminating each in a ring deeply notched on the inner surface.

Fig. 449.



The author's enterotome.

Of 41 cases of this operation, performed by Dupuytren and other surgeons, 38 survived, and 3 died; one from peritonitis, one from indigestion, and one from fecal effusion. Of the former 29 were radically cured in from two to six months, but the rest retained, in spite of all that could be done, fistulous openings, which compelled them constantly to wear a compress and bandage, to prevent the escape of air, mucus, bile, and even feces. Three-fourths of the cases had been caused by gangrene from strangulated hernia, and the remainder by penetrating wounds, attended with more or less loss of substance of the tube.

An intestinal fistule caused by a wound of the bowel, is always extremely difficult to cure, owing to the small size, or entire absence, of the intervening spur not admitting of the ready application of the seton or enterotome. In an intractable case of this kind under my charge some years ago, I was strongly tempted to liberate the bowel from its attachments, and either to sew up the opening, or to excise a small portion, prior to restoring it to the abdomen. The patient's indisposition to submit to the operation was the only thing that prevented me from carrying out my design.

When the fistule has been occasioned by ulceration of the bowel, or by a stercoraceous abscess, especially if it is connected with the cæcum or colon, great benefit, often followed by a permanent cure, will be derived from a rigid and protracted observance of the prone position, as originally suggested by Sir B. C. Brodie. The opening in many, if not in most, of these cases exists at the posterior surface of the tube; hence if the patient lies constantly on his abdomen, the fecal matter will gradually cease to escape, and an opportunity will thus be afforded the fistule to close.

Finally, when, after the feces have resumed their natural route, the external opening refuses to heal, an attempt may be made to effect its closure by a dermoplastic operation, the flap being borrowed from the neighboring parts. In general, however, the effort will prove abortive, owing to the difficulty of preserving the flap from the contact of intestinal matter. Instances of cure, in these obstinate cases, by the repeated and careful application of the actual cautery, have been reported by Dieffenbach and others.

SECT. XVI.—AFFECTIONS OF THE UMBILICUS.

The only affections of the umbilicus deserving of notice in a work of this kind are ulceration, hemorrhage, fungous excrescences, serous cysts, carcinoma, and fistules.

1. *Ulceration* of the navel is almost peculiar to early infancy, and is usually occasioned by neglect of cleanliness, or rude traction of the cord with a view of expediting its separation. Varying in degree from the merest excoriation to a deep spreading sore, it is always attended with inflammation of the adjacent parts, pain, tenderness, discoloration, and a thin, ichorous, acrid, and offensive discharge. The disease, although in general readily amenable to treatment, is sometimes exceedingly obstinate and rebellious, lasting for many years, now receding and almost entirely disappearing, and then again breaking out afresh, and proceeding with all its former energy. Occasionally an ulcer of this kind is the seat of a periodical hemorrhage, vicarious of the menses; and cases occur in which it is evidently of an eczematous nature, influenced in its origin and march by a strumous condition of the system.

The *treatment* of this disease will be greatly promoted, in most cases, by an occasional laxative, in union with an antacid. When the patient is pale and debilitated, the use of tonics will be necessary. The best topical remedies are mild astringent lotions, such as solutions of zinc, lead, or copper, either alone or combined with tannin, Turner's cerate, or the dilute ointment of the nitrate of mercury. Dusting the surface of the ulcer with calomel, or covering it with dry lint, sometimes answers better than anything else. In all cases the greatest attention should be paid to cleanliness. When the sore is prevented from healing by overhanging integument, hardly anything short of the removal of the redundant structure will suffice, inasmuch as it serves to retain the secretions and tends to rub and irritate the raw surface. When the affection extends into adult life, a mild mercurial course may be required.

2. *Hemorrhage* of the navel is sometimes met with, generally about the time of the detachment of the cord, in delicate, sickly infants. If not speedily arrested it may terminate fatally, as I have known it to do in several cases. The most effectual remedy is the twisted suture. In the milder cases the object may sometimes be attained by the use of persulphate of iron aided by the compress and bandage.

3. The *fungoid tumor* of the umbilicus is easily recognized by its florid, violaceous or purple color, by its soft consistence, and by its rounded or conical shape. Its volume ranges from that of a cherry to that of a small fig, its base being at one time narrow, at another broad or expanded. It generally protrudes from the centre of the navel, although occasionally it is deeply buried at its bottom, with very little or no discharge, and without any appearance of ulceration or of inflammation in the surrounding parts. When rudely touched or irritated, it is very apt to bleed. Occasionally there is an aperture at its summit, admitting of the passage of a fine probe, but of no escape of fluid. I recently had under my care a lady, forty-seven years old, who has had a tumor of this kind from birth. It first became sore during one of her pregnancies, and has continued to trouble her more or less ever since. It is about the volume of a strawberry, of a florid color, tuberculated on the surface, and the constant seat of a thin, fetid discharge, occasionally attended with a good deal of pure blood. It is sometimes quite painful, and now and then it is covered with a scab.

Removal is effected with chromic acid, applied once every other day; aided, if necessary, by the ligature, especially when the morbid growth is adherent by a narrow pedicle. When the reverse is the case, the tumor may be shaved off with the knife, repullulation being prevented by nitrate of silver, astringent lotions, and other suitable remedies.

4. A *cyst* containing water is occasionally met with at the umbilicus, and may acquire a considerable bulk. The tumor is soft, elastic, and fluctuating, free from pain, and slightly translucent. Its seat is apparently in the subperitoneal cellular tissue. The only disease with which it is liable to be confounded is umbilical hernia, but from this it may always be readily distinguished by its history, by its consistence, and by its fixedness, or our inability to push it into the abdominal cavity. In cases of doubt recourse is had to the exploring needle. The proper remedy is evacuation of the contents of the cyst, and the injection of tincture of iodine, as in the operation for the cure of hydrocele.

5. The existence of *carcinoma* of the navel is extremely uncommon, and were it not that its occurrence here exhibits some important practical peculiarities it would not be entitled to distinct notice. The principal form in which it has hitherto been observed is the scirrhous, commencing as a small, indurated growth in the cicatricial tissue, from which it gradually extends, on the one hand, to the subcutaneous cellular substance, and, on the other, by means of the fibrous structures of the umbilicus, to the peritoneum. The tumor, which is nearly always very tardy in its progress, and which is met with chiefly in old subjects, is of great hardness, and the seat of sharp, lancinating pains; circumstances by which it may always be readily distinguished from other diseases. The skin is of a purple or violaceous color, and finally yields to ulceration, followed by a thin, ichorous, fetid discharge. The growth would seem, at first sight, to be superficial, but a more thorough exploration soon shows that it extends inwards towards the abdominal cavity, one portion occupying the subcutaneous cellular tissue, and the other the subperitoneal, the shape of the mass resembling that of a shirt-stud, the constricted part corresponding with the navel. The treatment is limited to palliation, excision being improper, as it could not, owing to the peculiar arrangement of the tumor, be effected without the risk of peritonitis.

A case of encephaloid tumor of the umbilicus, circumscribed, well-defined, and about the volume of a large almond, has been recorded by Dr. H. R. Storer, of Boston, as having occurred in a woman, forty years of age. It exhibited during life all the features of an ordinary umbilical hernia.

6. Stercoraceous, urinary and other *fistules* are sometimes met with at the umbilicus, but their occurrence, besides presenting nothing peculiar, is so uncommon as not to require any special notice.

In the *vesico-urachal fistule*, the urachus, which connects the summit of the bladder to the anterior wall of the abdomen, remains pervious, and thus allows the urine to escape at the umbilicus. The affection is nearly always congenital. The orifice of the fistule is indicated by a soft, reddish papilla, and, in general, readily admits of the introduction of a probe into the bladder. A case has been related in which such a passage was the seat of a ring-shaped calculus, formed round a hair. When the fistule proves troublesome a cure may usually be easily effected by paring the edges of its orifice, and approximating them with the hare-lip suture.

SECT. XVII.—GENERAL DIAGNOSIS OF ABDOMINAL AFFECTIONS.

There are few surgeons, however skilful or experienced, who are not at times sadly perplexed in regard to the diagnosis of abdominal affections. These affections are not only of frequent occurrence, but greatly diversified in their character, and it is therefore of paramount importance that they should be accurately distinguished from each other. Several of them, indeed, sometimes coexist, thus not a little augmenting the embarrassment. Moreover, serious difficulty occasionally arises in determining whether the disease is seated in the parietes or in the cavity of the abdomen.

The surgical affections of the abdomen may, diagnostically viewed, be divided into two distinct classes:—1. The acute; and 2, the chronic. The former consist principally of abscesses, hernia, peritonitis, and retention of urine; the latter, of different morbid growths, enlargements, and effusions, together with certain pulsations closely simulating those occasioned by aneurism.

In all explorations of this kind the bowels should be thoroughly evacuated as a preliminary measure, and the surgeon should rapidly recall to mind the different regions of the abdomen with their respective contents. The patient should lie upon his back, or alternately upon his back and side, the muscles of the abdomen should be thoroughly relaxed by elevating the shoulders and thighs, and all the manipulations—palpation and percussion—should be performed with the utmost gentleness, otherwise they will be sure to occasion suffering, and so mar the result. The patient's mind should be diverted as much as possible, and no mistaken notions of delicacy should be permitted to interfere with the object of the exploration. If one examination does not suffice, another should be instituted, and thus the investigation should be continued until the diagnosis of the case has been satisfactorily determined. Sometimes chloroform may advantageously be exhibited, especially when there is extraordinary rigidity of the abdominal muscles.

Abscesses of the abdomen are for the most part of a phlegmonous nature, and are attended by the ordinary signs of such affections. They may be developed just beneath the surface, among the muscles, or immediately exterior to the peritoneum. Sometimes they are stercoraceous, hepatic, splenic, ovarian, or pelvic. Rigors always occur when the matter is deep-seated, or slow in finding an outlet, followed by hectic irritation, and rapid emaciation. An abscess in the epigastrium and in the left side of the liver may receive a direct impulse from the aorta, and thus simulate aneurism. The stercoraceous abscess is most common in the groin and in the right iliac region; in the former, as a consequence of strangulated hernia, in the latter of disease of the cæcum and vermiform appendix.

Hernia is most frequent in the groin, at the upper and inner part of the thigh, and at the umbilicus. If reducible, it will be found to be soft and gaseous, or partly soft and partly hard, as when it contains omentum, to receive an impulse on coughing, and to return with a gurgling noise. When strangulated, the tumor is tender and painful, or soon becomes so, the bowels are constipated, colicky pains are experienced, and at length stercoraceous vomiting ensues. Reduction is attended with more or less difficulty. Inguinal hernia is sometimes closely simulated by an undescended testicle, suddenly taking on inflammation, and a similar effect may be produced here, as well as in the thigh, by a diseased lymphatic ganglion. Occasionally these affections coexist. Whenever symptoms of strangulation occur, the judicious surgeon will not fail to seek for hernia, intussusception of the bowel, or visceral disease. Finally, hernia is sometimes simulated by psoas abscess, pointing either above or below Poupart's ligament.

Acute *peritonitis*, whether the result of external injury, strangulated hernia, fecal extravasation, cold, or tuberculosis, is characterized by excessive tenderness on pressure of the abdomen, retraction of the thighs, collapse of the features, tympanites, gastric irritability, and a small, hard, wiry, frequent pulse.

A distended *bladder*, from retained urine, might be mistaken for ascites or ovarian dropsy, but such errors can only happen in the hands of the most ignorant and careless observer. In general, the history alone of the case is quite sufficient to establish its true character.

Distension of the abdomen may be produced by fluid in the peritoneal cavity, gas in the intestinal tube, and urine in the bladder. In the first case, the collection generally occurs slowly, and is nearly always dependent upon organic disease of the heart, liver, spleen, peritoneum, or large vessels. Its presence is indicated by dulness on percussion, by fluctuation, and by the gravitation of the fluid to the lower part of the abdomen during the erect, and to the posterior and lateral aspects of the cavity, during the recumbent, posture. The existence of gas, meteorism, or tympanites, is declared by a hollow, drum-like sound on percussion, generally perceptible over the entire abdomen, and by the unalterable condition of the tumor during change of posture. The tympanites is sometimes the knife, repullulation being prevented by nitrate of silver, astringent lotions, and other suitable remedies.

4. A *cyst* containing water is occasionally met with at the umbilicus, and may acquire a considerable bulk. The tumor is soft, elastic, and fluctuating, free from pain, and slightly translucent. Its seat is apparently in the subperitoneal cellular tissue. The only disease with which it is liable to be confounded is umbilical hernia, but from this it may always be readily distinguished by its history, by its consistence, and by its fixedness, or our inability to push it into the abdominal cavity. In cases of doubt recourse is had to the exploring needle. The proper remedy is evacuation of the contents of the cyst, and the injection of tincture of iodine, as in the operation for the cure of hydrocele.

5. The existence of *carcinoma* of the navel is extremely uncommon, and were it not that its occurrence here exhibits some important practical peculiarities it would not be entitled to distinct notice. The principal form in which it has hitherto been observed is the scirrhous, commencing as a small, indurated growth in the cicatricial tissue, from which it gradually extends, on the one hand, to the subcutaneous cellular substance, and, on the other, by means of the fibrous structures of the umbilicus, to the peritoneum. The tumor, which is nearly always very tardy in its progress, and which is met with chiefly in old subjects, is of great hardness, and the seat of sharp, lancinating pains; circumstances by which it may always be readily distinguished from other diseases. The skin is of a purple or violaceous color, and finally yields to ulceration, followed by a thin, ichorous, fetid discharge. The growth would seem, at first sight, to be superficial, but a more thorough exploration soon shows that it extends inwards towards the abdominal cavity, one portion occupying the subcutaneous cellular tissue, and the other the subperitoneal, the shape of the mass resembling that of a shirt-stud, the constricted part corresponding with the navel. The treatment is limited to palliation, excision being improper, as it could not, owing to the peculiar arrangement of the tumor, be effected without the risk of peritonitis.

A case of encephaloid tumor of the umbilicus, circumscribed, well-defined, and about the volume of a large almond, has been recorded by Dr. H. R. Storer, of Boston, as having occurred in a woman, forty years of age. It exhibited during life all the features of an ordinary umbilical hernia.

6. Stercoraceous, urinary and other *fistules* are sometimes met with at the umbilicus, but their occurrence, besides presenting nothing peculiar, is so uncommon as not to require any special notice.

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Of the *tumors* which are liable to occur in the abdomen, some are fixed, others movable or floating. They may, moreover, be of new growth, or they may consist simply of enlargements of some of the viscera, as the spleen, liver, omentum or ovary. Hence to refer them to their proper category is not always by any means an easy matter.

The most common of the fixed tumors of the abdomen are the encephaloid and the colloid, which sometimes completely fill its cavity, running in among the viscera, and producing one confused mass of disease, with enormous distension. The liver, mesenteric ganglions, uterus, and ovary are also capable of prodigious enlargement, especially the latter, the weight of which sometimes nearly equals that of the body.

Floating tumors of the abdomen are, for the most part, connected either with the omentum, the spleen or the ovary; more rarely with the liver. As the name implies, they shift their locality with the position of the patient, rolling about from side to side, being here at one time, and there at another. This is especially true of omental tumors, which often slip about in the most perplexing manner. Ovarian tumors are almost always movable in their earlier stages; their situation is, at first, lateral and pelvic, but by degrees they ascend into the abdomen, and assume a median position, so as to render it difficult, if not impossible, to determine on which side they originated. A hydatid, attached to the liver, an enlarged spleen, and a dislocated kidney may float about very much as an omental or ovarian tumor.

Aneurism of the abdomen is liable to be simulated by numerous affections, often existing under very dissimilar conditions. Of these affections the principal are tumors of the stomach, liver, pancreas, mesentery, and omentum, impacted fecal matter, masses of worms, and gaseous accumulations, overlying the ventral arteries, especially the aorta, and thus receiving their pulsations.

Aneurism of the ventral aorta is much more frequent in men than in women, and seldom occurs before the age of fifty. The tumor is fixed, and easily recognized in the flaccid state of the bowels. The murmur, thrill, and impulse are steady and persistent, not changeable and occasional, as in mere nervous or inflammatory affections of the aorta. In aneurism of the superior mesenteric artery the tumor is generally more or less movable.

Tumors connected with the stomach and omentum are commonly of a floating character, and readily pushed from side to side; those of the pancreas and mesentery, on the contrary, are nearly always fixed, and remarkably hard, firm, and unyielding, especially when they are of a cancerous nature. In the latter case, the enlargement is gradual, and usually attended with great gastric irritability. Fecal and gaseous accumulations generally promptly disappear under the use of a brisk purgative. An enlarged liver sometimes receives the pulsations of the aorta, and a similar phenomenon has been witnessed in a distended bladder. Extraordinary fulness in the lumbar region is denotive of hypertrophy, dropsy, or encephaloid of the kidney. If the affection is associated with excessive pain and rigors, the existence of abscess may be suspected. In chronic enlargement of the spleen, the tumor is seated in the left side, from which it may extend across to the umbilicus, and even down into the hypogastrium; it is very hard and firm, almost immovable, and more or less sharp along its dextral margin. A distended gall-bladder may form a large swelling, projecting over towards the umbilicus, pyriform, elastic, fluctuating, and varying with the position of the body. Jaundice is generally a prominent attendant upon the disease.

The *stomach* is occasionally displaced by a mass of solid substance in its interior, as in the remarkable case recorded by Mr. Marshall, in which the pyloric extremity of the organ was dragged down into the left inguinal region by a collection of pins, swallowed from time to time by the patient. The tumor thus formed was of the size and shape of the placenta; it weighed nine ounces, and was distinctly traceable during life.

Mr. Gull has graphically described what he calls the *phantom tumor*, on account of its deceptive character, which has sometimes been so great as to lead to the most serious errors of diagnosis. Thus, Dr. Bright mentions a case in which the surgeon was so thoroughly convinced of the existence of a cyst that he was induced to perform ovariotomy, when, as was afterwards proved, the fallacious appearance was solely dependent upon a tympanitic condition of the abdomen. The phantom tumor is most common on the right side, in young, nervous, hysterical females. The causes which give rise to it are, principally, solid fecal accumulations, irregular contractions of the bowel at two points, with intervening distension with flatus or fluid matter, and spasmodic rigidity of the muscles of the abdomen, especially the straight.

Perplexity may be experienced in determining whether a tumor is situated in the parietes or in the cavity of the abdomen. The former are occasionally the seat of fibrous, encysted, and encephaloid formations, and such is the obscurity attending their development as to render it often extremely difficult to establish their true site and character.

A gravid *uterus* has sometimes been mistaken for ascites, or ovarian dropsy; an operation has been performed, no fluid has escaped, and the true nature of the case was only determined by the delivery of the child. On the other hand, numerous examples have occurred in which pregnant females were tapped under the supposition that they labored under ascites.

Finally, symptoms of a puzzling character may be induced by abnormal *pulsations* of the aorta. The occurrence, although most common in nervous, anemic, or hysterical females, is also occasionally witnessed in men, and is usually associated with inordinate action of the carotid arteries. Its exciting cause is either an impoverished condition of the blood, or neuralgia of the ventral aorta, or of this vessel, and of the solar plexus. It may likewise depend upon inflammation of the aorta. The pulsations are frequently so violent as to admit of being both seen and felt. The best way to escape error is to examine the abdomen after thorough evacuation of the bowels, when it will generally be easy to trace the outline of the affected vessel, and thus remove all doubt respecting the real character of the complaint.

CHAPTER XVII.

DISEASES AND INJURIES OF THE URINARY ORGANS.

SECT. I.—AFFECTIONS OF THE KIDNEYS AND URETERS.

THE kidneys are liable to wounds, lacerations, contusions, fistules, inflammation, abscess, calculi, dropsy, hydatids, worms, encephaloid, and hemorrhage; affections all of more or less surgical interest.

I. *Wounds.*—Wounds of these organs, whether incised, lacerated, or gunshot, generally speedily terminate fatally, either from shock, or shock and hemorrhage, from inflammation of their proper substance, or from peritonitis, the latter event being sure to happen whenever there is the slightest escape of urine into the abdominal cavity. Death occasionally occurs at a somewhat remote period, as a few weeks or months after the infliction of the injury, in consequence of pyemia, secondary hemorrhage, hectic irritation, or purulent infiltration in the cellular tissue around the affected organ. Wounds of the pelvis and great vessels of the kidneys are particularly fraught with danger, inasmuch as the former is almost invariably followed by fatal extravasation of urine, and the latter by exhausting hemorrhage. The prognosis in wounds of the cortical substance is more favorable than in wounds of the tubular, and in wounds of the posterior surface of the kidney than of the anterior, or where it is covered by peritoneum.

The existence of a wound of the kidney is denoted by the presence of blood in the urine, a frequent desire to micturate, pain and sense of weight in the lumbar region, and retraction of the testicles, accompanied, if the injury is at all severe, by excessive prostration, nausea and vomiting, deadly pallor of the countenance, clammy perspiration, and coldness of the extremities. These symptoms, however, may all be fallacious; but, if superadded to them there is an escape of urine at the wound, no doubt can remain respecting the true character of the lesion. Useful information may sometimes be obtained from an examination of the situation and direction of the wound.

In the *treatment* of these lesions the first thing to be done is to remove foreign matter, if any be present, and the next to limit, as much as possible, the resulting inflammation. All officious probing is, of course, avoided, nor is the opening dilated, unless there is the most positive necessity for such a procedure. The posture of the patient should be such as to render the wound the most depending part of the body, in order to facilitate drainage and the ready passage of the urine. If plethora exist, blood should be taken freely from the arm and by leeches from the loin and abdomen, the bowels evacuated by gentle cathartics, and the heart's action subdued by veratrum viride or aconite, in combination with morphia. Diuretics must be rigidly abstained from, and thirst allayed with ice. The use of the catheter will be required if the bladder is filled with clotted blood, obstructing the flow of urine. If the renal lesion is complicated with peritoneal, nothing should be permitted to pass the bowels for many days. Urinary infiltration, erysipelas and abscesses consequent upon the injury, must be treated upon general principles.

2. *Lacerations.*—Accidents of this kind may be produced by falls, blows, or kicks, and are generally associated with serious injury of the abdominal viscera, with fracture of the ribs and pelvic bones, and with contusion of the skin and muscles, though occasionally there is no mark whatever of external violence, not even the slightest ecchymosis. The rent may be confined to the cortical substance, or it may extend through this into the tubular, or even into the pelvis and calyces; its direction is usually transverse or longitudinal. Sometimes the organ is literally split in two.

The accident is commonly attended with considerable effusion of blood into the surrounding cellular tissue, and sometimes also into the peritoneal cavity. The symptoms resemble, in general terms, those of a wound of the kidney; the urine is bloody, and the distress in the lumbar region excessive. The period at which death occurs varies from a few minutes to several hours, days, or weeks. The injury, however, is not always fatal. In favorable cases, the gap is gradually repaired, and the patient recovers. The treatment must be strictly antiphlogistic.

3. *Contusions.*—A mere contusion of the kidney sometimes proves to be a very serious accident, leading to violent, if not fatal, inflammation of its substance, attended with great constitutional disturbance. The urine is generally bloody, the lumbar region is more or less profoundly ecchymosed, and the patient is unable to move about in bed. The accident is often followed by peritonitis, and by extensive abscesses in the cellular tissue around the injured organ. A very slight blow upon the loin is capable of causing death when the kidney contains a ragged calculus, the sharp points puncturing the bloodvessels.

4. *Fistules.*—Wounds, lacerations, contusions, and abscesses of the kidney are occasionally succeeded by a renal fistule, occupying, for the most part, the lumbar region, but sometimes the groin or abdomen. The affection, which is characterized by a constant discharge of pus and fetid urine, always evinces a peculiar obstinacy, although quite a number of cases have been reported in

which it disappeared spontaneously. Dr. Hermann Demme, of Bern, states that, during the Italian campaign in 1859, he saw not less than three instances of renal fistule, consequent upon gunshot injury, recover in this way. Efforts at a cure should be aided by attention to cleanliness, stimulating injections, and cauterization with nitrate of silver.

5. *Inflammation.*—Inflammation of the kidney may be acute or chronic, the latter being by far the more frequent of the two. As an idiopathic affection it is extremely rare. The most common exciting causes are external injury, the presence of renal calculi, irritating diuretics, stricture of the urethra, enlargement of the prostate gland, and chronic disease of the bladder. In some cases it is provoked by the gouty or rheumatic diathesis. The inflammation may be limited to the proper renal tissue, or it may at the same time involve the pelvis and calyces, thus constituting what is termed *pyelitis*.

The most prominent symptoms of *acute nephritis* are sharp, spasmodic, or dull, heavy, deep-seated, aching pains in the loins, increased by pressure and motion, and extending along the spermatic cord, up the back, down the thigh, and into the pelvis; retraction of the testicles; scanty, high-colored urine; irritability of the bladder, with a frequent desire to micturate; pyrexia; great thirst; restlessness; nausea, vomiting, and, in most cases, constipation of the bowels. If the urine be examined with the microscope, blood, pus, and renal casts may generally be detected. If permitted to progress, the disease either passes into suppuration, or it assumes the chronic form.

The *treatment* consists, mainly, in perfect quietude of mind and body, general and local bleeding, fomentations of the loins, mercurial purgatives with morphia, antimony, and veratrum viride, and cooling, demulcent drinks. If the attack proves obstinate, a large blister may be applied to the affected region. When the disease is manifestly of a gouty or rheumatic nature, the most suitable remedies will be colchicum and Dover's powder, with alkaline drinks.

Chronic nephritis is generally dependent upon organic disease of the urethra, bladder, or prostate gland, attended with permanent obstruction to the free evacuation of the urine. In consequence of the obstacle thus occasioned, the ureters are habitually distended with urine, and are eventually transformed into subsidiary reservoirs, in which the fluid accumulates in such a manner as to produce serious pressure upon the renal tissues, and ultimately their partial, if not complete, destruction.

The suffering in chronic nephritis is usually much milder than in the acute form. The pain is less severe, and seldom extends to any distance among the neighboring structures; there is no retraction of the testicles; the bladder is irritable and impatient of its contents; and the general health, perhaps long impaired, gradually declines, the patient losing flesh, sleep, appetite, and strength. By and by hectic fever sets in, attended with frequent fits of headache, drowsiness, and vomiting, and life is finally worn out by sheer exhaustion. Sometimes death is caused by suppression of urine, preceded and accompanied by coma and convulsions; at other times, by the sudden supervention of acute nephritis, an event generally announced by rigors, violent fever, and delirium, with great increase of the local distress.

The urine in chronic nephritis is commonly alkaline, turbid, and loaded with calcareous matter and ammoniaco-magnesian phosphates; not unfrequently it is albuminous, tinged with blood, or mixed with pus, flakes of lymph, and renal casts.

The kidney after death is found to be variously altered; generally softened and disorganized, atrophied or enlarged, and converted into cysts, or into a single pouch destitute of secreting tissue. The capsule is usually opaque, thickened, and easily separable, but firmly adherent to the fat and areolar substance of the loin.

The *treatment* of chronic nephritis is commonly unsatisfactory. In all cases an attempt should be made to ascertain, as soon as practicable, the nature of the exciting cause, the removal of which will often, of itself, be sufficient to cure the disease. Tonics and alterants, with a regulation of the diet and bowels, will, generally, prove highly beneficial. Fatigue and sexual excitement should be avoided; opium will be required to allay pain and promote sleep; and the surface should be well protected with flannel. Many cases will be improved by the warm bath, by change of air, and by alkaline or acid preparations in combination with uva ursi, lupuline, or balsam of copaiba.

6. *Abscess.*—Renal abscess may be occasioned by ordinary inflammation, tuberculosis, external injury, or the presence of a renal calculus. Sometimes it is produced by the irritation consequent upon disease of the bladder, enlargement of the prostate gland, or stricture of the urethra. The abscess may be seated on the outer surface of the organ, just beneath its fibrous envelop, in its proper substance, or in the pelvis and calyces, especially when it depends upon obstruction of the ureter. The disease may be acute or chronic. In chronic abscess, the kidney is sometimes completely destroyed, the parenchymatous structure being replaced by a thick, laminated, multilocular sac, intersected by hard, fibrous bands.

Abscess of the kidney is sometimes dependent upon disease of the spinal marrow, or upon the nerves which are detached from it. The subjects are usually affected with paralysis of the lower half of the body, accompanied with pain and tenderness of the sacro-lumbar region, irritability of the bladder, and a phosphatic condition of the urine. The kidney sometimes suffers from abscess in pyemia, after injury of the head, the operation of lithotomy, and compound fractures and dislocations.

The matter contained in these abscesses may be perfectly homogeneous, thick, opaque, and yellowish, like healthy pus, or it may be intermixed with various kinds of foreign ingredients, as lymph, blood, urine, sabulous matter, renal casts, and even calculous concretions. Occasionally it is serous, or sero-purulent, lactescent, whitish, or greenish-white, thin or thick, viscid or curdy. In the scrofulous form of the disease it always exhibits the characters peculiar to an abscess of that nature. The pus, which varies in quantity from a few drachms to several quarts, may be entirely inodorous, or intensely fetid.

Renal abscesses generally open into the ureter or pelvis of the kidney, their contents being thence discharged along with the urine. More rarely the matter finds its way to the external surface, into the cellulo-adipose tissue of the loin, or into the intestinal canal. It may also be evacuated into the peritoneal cavity; and cases have occurred in which it burst into the bronchial tubes, from which it was subsequently discharged by coughing.

The *symptoms* of renal abscess do not differ essentially from those which attend suppuration in the other viscera. There is generally severe pain in the corresponding loin, extending down the spermatic cord, groin, thigh and sacrum, the urine is high-colored and scanty, the patient finds it difficult, if not impossible, to walk and turn in bed, intense febrile disturbance is present, with gastric irritability, and, at length, violent rigors come on, preceded by throbbing pain, and followed by copious sweats. If the matter passes off by the urine, its characteristic appearances may always be readily detected in that fluid, and in most cases a distinct swelling, exquisitely tender on pressure, and gradually enlarging in size, may be perceived in the lumbar region, especially when the pus is pent up. When the disease is of a scrofulous nature, the symptoms are generally more mild, and several months commonly elapse before the abscess acquires much bulk. When an acute renal abscess opens or points externally, the event is invariably preceded by an erysipelatous blush of the surface, and by an œdematous condition of the subcutaneous areolar tissue. In chronic or scrofulous renal abscess, instead of these phenomena, there is, on the contrary, in general merely a glossy appearance of the skin, along with more or less enlargement of the subjacent veins.

The *diagnosis* of renal abscess is usually readily determined by its peculiar symptoms, and by a careful study of the history of the case. The chief risk of error is in the chronic or strumous form of the disease, which might, even in the hands of a cautious observer, be mistaken for an encephaloid tumor or hygromatous cyst.

The *prognosis* is commonly unfavorable; a case may, it is true, occasionally recover, but in general the disease terminates fatally, whatever may be its nature. When the abscess opens externally, the patient may live for some time with a renal fistule.

The *treatment* of this affection must, at first, be strictly antiphlogistic, and afterwards supporting. When the matter is tending externally, its approach to the surface may often be expedited by the application of a blister. As soon as fluctuation becomes apparent, or, even before, if there is excessive local and constitutional suffering, a free incision should be made, to afford full vent to the pent-up fluid.

7. *Calculi.*—Calculi of the kidney may be developed either in the parenchyma of the organ, or in the calyces, infundibula, or pelvis of the ureter, a drop of blood, or a portion of inspissated mucus generally serving as their nucleus. Their formation often begins at an early period of life, either as the result of external injury, disease of the spinal cord, or of a peculiar diathesis of the system; and they usually consist of the same chemical elements as calculi of the bladder.

The most common species of renal concretion is the uric, which is usually of a light brownish color, and of a spherical, oval, or conical shape, with a finely tuberculated surface. Next in point of frequency is the oxalic, of a dark complexion, and of an irregular, rounded figure, with a rough exterior, similar to that of a mulberry. The ammoniaco-magnesian calculus is uncommon in the kidney; it generally occurs in connection with one or the other of the preceding species, as an external layer, from a line to half an inch in thickness. The phosphatic concretion is also rare, and is met with chiefly as a consequence of injury of the spinal cord.

Dr. Scott Alison has described a case of what he calls the blood calculus of the kidney. It occurred in the body of a man dead of phthisis. The concretions were of a black color, from the size of a coriander-seed to that of a small horse-bean, and were essentially composed of blood, of tolerably firm consistence.

The number of renal concretions ranges from a single one to as many as six, ten, or even a dozen. The oxalic calculus is generally solitary. Their volume is usually in an inverse ratio to their number. In shape they are, for the most part, round or oval. A renal concretion occasionally pretty accurately represents not only the general outline of the kidney, but also of the calyces and infundibula.

The effects which a concretion exercises upon the substance of the kidney is often most disastrous, especially when it is very bulky or has been long retained. Gradually the parenchymatous substance is absorbed, until, at length, perhaps nothing remains but the fibrous envelope of the organ, converted into a thick, indurated sac, partially filled with pus, or sero-purulent fluid. The corresponding ureter may be closed, as well as variously changed in structure, and serious morbid alterations are often met with, as a direct consequence of the renal, in the bladder and prostate gland.

Persons affected with renal calculus generally suffer more or less severely in the loin and pelvis, the pain, which is dull and aching—sometimes sharp, stabbing, or neuralgic—radiating about in different directions—being liable to serious exacerbations from the slightest exposure, or irregularity of diet; the general health is habitually deranged; the stomach is teazed with flatulence and indigestion; the bowels are costive; the system is extremely susceptible to atmospheric vicissitudes; the countenance is wan and sallow; and there is a frequent desire to void urine, which is usually materially altered in its physical and chemical properties. In many cases, pure blood is passed, especially after rough exercise. Ultimately hectic irritation ensues, and the patient dies from sheer exhaustion, an abscess having, perhaps, previously formed, and pointed in the loin, or discharged its contents along the ureter. Occasionally the immediate cause of death is suppression of urine.

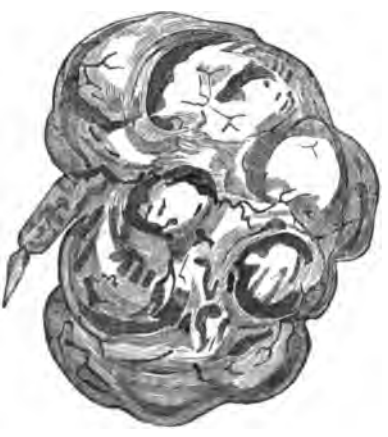
The *treatment* in retained renal calculus is, in general, altogether palliative, consisting of the abstraction of blood by cups and leeches, the warm bath, and the administration of anodynes. Horseback exercise must be avoided, the diet carefully regulated, the bowels constantly kept in a soluble condition, and the skin well protected with flannel.

When the stone is large, and productive of incessant and severe suffering, *nephrotomy* has been recommended; but such a procedure could only be thought of when the concretion is of immense bulk, or when it has worked its way partially through the loin by ulceration. In such a case it might easily be cut down upon, and removed, with a fair prospect of a tolerably good recovery.

Renal concretions often descend into the bladder. Their progress along the ureter is sometimes slow and painful; at other times rapid and almost free from suffering. The amount of the local distress is often greatly influenced by the nature of the concretion, and by the degree of resistance afforded by the ureter. A small, smooth calculus usually causes little inconvenience; while a large or rough one often occasions exquisite torture. The process of descent, which generally occupies from twelve to forty-eight hours, is characterized by excessive nausea and vomiting, great restlessness and jactitation, pain in the back, groin, and thigh, retraction of the testicles, numbness along the spermatic cord, a sense of constriction at the umbilicus, and tenderness of the hypogastrium, with coldness of the extremities, rigors, and a feeling of excessive prostration. The urine gradually accumulating behind the calculus, the ureter is slowly dilated, and the concretion at length reaches the bladder, from which it is either ejected, or it remains there until it is removed by operation. As soon as the passage is completed, the pain and sympathetic irritation subside, the patient frequently falling into a tranquil and refreshing sleep. The descent of the calculus may be expedited, and rendered less painful, by the abstraction of blood from the arm, the loins, or hypogastric region, large doses of morphia, along with castor oil and turpentine, the hot bath, fomentations, and anodyne injections. The free use of chloroform, by inhalation, will also prove highly beneficial.

8. *Dropsy.*—Enormous quantities of serum occasionally collect in the kidney from obstruction of the ureter, and the consequent conversion of the organ into a mere membranous pouch, capable of holding many quarts of fluid, and constituting what is called renal dropsy. The tumor thus produced projects at the lumbar region, forming an immense swelling, soft, fluctuating, fixed in its situation, and unaccompanied by discoloration of the integuments, except when, as occasionally happens, the fluid manifests a disposition to point and discharge itself. The general health suffers greatly, the patient becoming excessively emaciated, and finally sinking from exhaustion. If any doubt exists respecting the diagnosis, recourse is had to the exploring needle. The only chance of relief is tapping, experience having shown that the fluid is not amenable to absorption. When the tumor is multilocular, as in fig. 450, from a preparation in my cabinet, it may be obliged to be punctured at several points.

Fig. 450.



Multilocular cysts of the kidney

9. *Hydatids.*—Hydatids of the kidney are extremely uncommon. Usually developed in the parenchymatous substance, or excretory passages of the organ, they vary in size from a hempseed to that of an orange, and in number from one to several hundred. The older hydatids generally contain clusters of young ones, either loose or adherent to their inner surface. The outer cyst often possesses great firmness, and cases occur in which it is partially calcified, or incrusted with chalky matter. When very large or numerous, which, however, is rarely the case, these bodies may completely destroy the renal tissues, and so give rise to the same morbid states as a serous cyst or chronic abscess. They may remain

pent up in the situation where they are originally developed, or they may escape into the excretory canals, and be evacuated along with the urine. Occasionally, though very rarely, they make their way through the lumbar region by ulceration.

The existence of hydatids in the kidney is not indicated by any positive signs, except the presence of hooklets in the urine. When large or numerous, they may give rise to the appearance of a tumor in the loin, or ileo-lumbar region, but not of a characteristic nature. Severe local and constitutional distress is generally experienced, eventuating in fatal irritation.

The best remedy for destroying and dislodging these parasites is spirits of turpentine, in diuretic doses. Should they form a tumor, pointing externally, the proper plan would be to puncture it.

10. *Worms.*—The strongle, a slender, cylindrical worm, from two to six inches in length, and of a light grayish color, has occasionally been found in the pelvis and infundibula of the kidney. Sometimes it makes its way into the parenchymatous substance, causing suppuration, atrophy, and other mischief. The male strongle is smaller than the female, and tapers slightly towards each extremity. The head is obtuse, and furnished with an orbicular mouth, encircled by six hemispherical papillæ; the body, transversely striated, is marked by two longitudinal impressions, and the tail, which is incurvated, ends in a dilated pouch, from the base of which a penis projects. In the female, the tail is less pointed than in the male, with the anus just below the apex; the vulva is situated a short distance from the head, and communicates with a slender cylindrical vagina; the uterus, in the larger individuals, is about three inches long, and leads to a simple ovary, nearly four times the length of the body. The nervous system of the parasite consists of two delicate rings, one encircling the œsophagus, the other the anus, and connected by a single cord extended along the middle line of the belly.

This parasite causes much distress in the kidney, but affords no distinctive symptoms. When its presence is suspected, expulsion may be attempted with turpentine, cubebs, and balsam of copaiba.

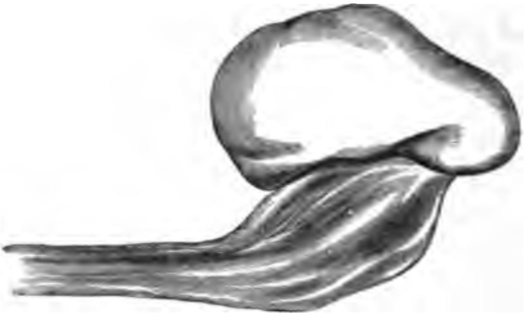
11. *Encephaloid.*—Encephaloid of the kidney is not uncommon, especially in children, in whom it often acquires an enormous size. It usually makes its appearance in small whitish masses, which, increasing in volume and number, gradually coalesce, and at length transform the organ into a soft, pulpy mass, of the color and consistence of the brain. The tumor, in the advanced stage of the disease, is irregularly lobulated, the fibrous envelop loses its identity, and the pelvis and ureter are occluded by the cancerous substance. A section of the morbid growth occasionally presents a large clot, composed of loose, concentric layers, similar to those in a rapidly formed aneurism. Persons affected with this disease sometimes pass encephaloid matter with the urine, which, together with the pain and enlargement of the lumbar region, and the absence of serious vesical disease, serves as a most important diagnostic character of the nature of the morbid action. The treatment must, of course, be wholly palliative.

12. *Hemorrhage.*—Renal hemorrhage is usually caused by mechanical violence, as blows, contusions, or the presence of renal calculi; but it may also be produced by congestion of the kidneys, hematoid growths, or diseased conditions of the blood, such as attend scurvy, scarlatina, or typhoid fever. The amount of blood may be small, or so great as to be exhausting. Unless accompanied by marked disorder of the kidney, entire absence of vesical disease, or the presence of renal casts in the urine, along with small spherical particles of epithelium, such a hemorrhage can seldom be satisfactorily distinguished from hemorrhage of the ureters, bladder, prostate gland, or urethra.

The *treatment* must be regulated by the nature of the exciting cause. If plethora exist, bleeding by cups, leeches, or the lancet may be necessary, with active purgation, and the exhibition of acetate of lead and opium. In cases of debility, the proper remedies will be tonics and astringents, as tincture of iron, sulphuric acid, alum, tannic acid, and quinine. Pounded ice may be applied to the loins.

The principal morbid alterations of the *ureters* are deposits of tubercular matter and lymph upon its surface, thickening and attenuation of its walls, and contraction or enlargement of its cavity. Dilatation, as in fig. 451, from a preparation in my collection, is generally produced by the retention of a renal calculus, or by some tumor seated along the course of the tube, and interfering with the egress of the urine. In the male, it is sometimes caused by stricture of the urethra; in the female, by the pressure of a carcinomatous uterus. In a case of this description, which fell under my notice several years ago, the left ureter was fully as large as the thumb, with remarkably thin, transparent walls. Occasionally the tube presents a singularly sacculated arrangement, some portions being greatly expanded, while others are very much contracted.

Fig. 451.



Dilatation of the ureter and pelvis of the kidney.

The ureter may be absent, or terminate in a cul-de-sac. When the bladder is wanting, it opens either into the urethra, vagina, or rectum. Occasionally, again, it is reduced to a small, narrow, almost impervious cord, which greatly impedes the passage of the urine.

Wounds and lacerations of the ureters are uncommon, and cannot be distinguished as separate and independent lesions. The effects are usually fatal, the most common causes of death being peritonitis and diffuse abscesses in the loin. From a paper, by Mr. Stanley, in the 27th volume of the Medical and Chirurgical Transactions of London, giving the particulars of two cases of ruptured ureter, one eventuating in recovery, and the other in death, it would appear that such accidents, when not immediately fatal, are sometimes followed by the formation of a cyst or pouch in the cellular tissue behind the peritoneum, serving as a reservoir for the urine. In both instances, the accumulation of fluid, which possessed all the properties of urine, was so great as to require repeated tapping. The cyst, in the fatal case, extended from the pelvis to the diaphragm, and communicated by a large, irregular aperture with the pelvis of the kidney. Death occurred in the tenth week after the accident, which had been occasioned by a blow from the wheel of a cart.

The *treatment* of a wounded or lacerated ureter does not differ from that in similar injuries of the kidney. Our measures must be strictly antiphlogistic, and no time must be lost in evacuating pent up fluid, whether simply purulent, or purulent and urinous.

SECT. II.—AFFECTIONS OF THE BLADDER.

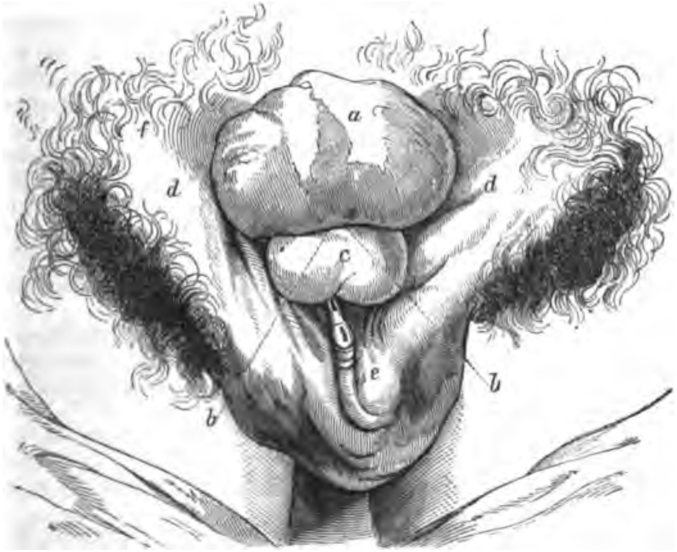
MALFORMATIONS.

The bladder is liable to various malformations, but almost the only one of any surgical interest is extrophy, consisting essentially in an absence of the anterior wall of the viscus, complicated with certain defects of the genital apparatus. The occurrence is much more common in males than in females. Of six cases that have come under my notice, all were males. Of nine cases observed by Mr. McWhinnie, of London, seven were males, and two were females.

The urinary tumor, situated at the lower part of the abdomen, is generally somewhat ovoidal or globular. Its volume is greatly influenced by the age and position of the subject. In the child, it rarely exceeds that of a walnut, while, in the adult, it may be as large as a fist, or a goose's egg. Very small when the subject is recumbent, it becomes quite prominent when he stands up, coughs, sneezes, or exerts himself. The surface of the tumor is of a bright red color, and is constantly covered with mucus, which thus protects it, in some degree, from the injurious impression of the atmosphere. In elderly subjects, the part is sometimes partially invested with a cutaneous pellicle, in consequence of which it is much less sensitive, or irritable, than in infancy, childhood, and adolescence, in which it is generally very tender, and apt to bleed on the slightest touch. The orifices of the ureters, generally situated at the inferior part of the tumor, are each marked by a small, conical eminence, from which the urine constantly dribbles, rendering the person uncomfortable to himself, and disgusting to those around him. The distance between the two apertures varies from one to two inches, according to the age of the subject.

The penis, preternaturally short and flattened, is bent backwards, and furnished with an imperfect prepuce. The cavernous bodies, attached below to the ischium, as in the natural state, are small and narrow, and are not always united along the middle line, except just behind the head of the penis. This organ is sometimes imperforate, and at other times it presents a gutter along its upper surface for the lodgment of the lower half of the urethra. When this is the case, the posterior part of the canal displays the verumontanum, the mouths of the ejaculatory ducts, and the orifices of the prostatic canals. From the peculiar conformation of the penis and urethra, the individual is necessarily impotent. The prostate gland exists generally in a rudimentary state. The seminal vesicles are also very diminutive, and are invariably situated behind the inferior part of the tumor. The ejaculatory ducts pursue their natural route, but are unusually small.

Fig. 452.



Extrophy of the bladder. *a*, Everted bladder. *b*, *b*, Orifices of the ureters. *c*, Penis without urethra. *d*, *d*, Pubic symphysis. *e*, Scrotum and testis. *f*, Congenital inguinal hernia.

The scrotum is sometimes absent; at other times it exists merely in a rudimentary state. In the latter case, it may contain the testicles, while in the former, these organs are either lodged in the groins, or in a cutaneous bag at each side of the tumor. The testicles are sometimes normal; at other times they are absent, or much diminished in volume.

The bodies of the pubic bones are absent, the pelvis is unusually broad and flat, and the groins are often the seat of hernia.

An excellent idea of the ordinary appearances of this species of malformation may be obtained from an examination of the accompanying drawing, fig. 452, taken from a young man whose case is well known in this country.

In the female, equally important changes are noticed in the genital organs. Thus, the clitoris may be absent, or deviate remarkably from the normal standard; the nymphæ are small and disjoined, and the labia extend from the sides of the tumor towards the anus, without coalescing behind. The uterus and ovaries are either absent, or they exist in a rudimentary state. Sometimes, however, these organs are fully developed, as is shown by the fact that the woman both menstruates and conceives, as in the interesting cases reported by Thiebault and Ayres.

Extrophy of the bladder was, until lately, universally regarded as utterly irremediable. In fact, all that can generally be done is to palliate suffering by attention to cleanliness, and by the use of a closely-fitting cover of gutta-percha, furnished with a bottle for receiving the urine. When this cannot be obtained, the part must be kept constantly covered with a thick, soft compress, renewed as often as it becomes wet and disagreeable. The skin around may, if necessary, be protected with suet, pomatum, or simple cerate.

It has recently been proposed to establish a channel for the conveyance of the urine from the bladder to the rectum, and, in one instance, the plan has actually been successfully employed, though not without seriously jeoparding the patient's life. The operator was Mr. Simon, of London. The method consisted in making the ureters open into the rectum, by passing instruments, armed with threads, from the former into the latter, the cords being retained until the communication was perfected. Violent constitutional symptoms ensued, and for a while the man was in great danger; but he ultimately recovered, and was able to wear a pad, by which the orifice in the abdomen was closed, and the urine forced into the bowel. In a case of Mr. Lloyd, in which an effort was made to establish an opening between the bladder and the rectum by means of a seton, the patient died in a few days from peritonitis.

Occasionally an attempt has been made to form a cover for the tumor by *autoplasty*, by borrowing the integuments from the adjacent parts, and inverting them, in the hope that the cutaneous tissue may ultimately assume the properties of the mucous, and so adapt itself to the presence of the urine. The flaps are united by suture, and are thoroughly protected during the treatment from the contact of the water. The extensive wound in the neighborhood should be as well closed as the case will admit of, the bowels should be locked up with morphia, which should also be freely used to allay pain, and the walls of the abdomen should, throughout, be maintained, in a relaxed condition. The greatest possible attention must also be bestowed upon cleanliness.

I must candidly confess my want of confidence in this operation, for the very nature of the affection which it is intended to remedy forbids the idea that it can ever be sufficiently successful to compensate the patient for the pains and perils incurred in its performance. The great danger after the operation will be erysipelas, likely to eventuate in sloughing of the flaps; but in addition to this there will certainly be some risk both of peritonitis and pyemia, if not also of congestive disease of the lungs. Much of this danger may, of course, be avoided by proper preliminary treatment.

This operation, so far as I know, has been performed only twice in this country. In 1858, Professor Pancoast resorted to it at the clinic of the Jefferson Medical College, but, although it was executed with great skill, the edges of the flaps only partially united. Soon afterwards, it was repeated by Dr. Ayres, of Brooklyn, upon a woman, twenty-eight years of age, with results, apparently, highly gratifying, the cutaneous cover being nearly perfect, and the patient, consequently, much improved in comfort. A full report of the case, illustrated by drawings, has been published by the operator.

WOUNDS.

Wounds of the bladder may be incised, punctured, lacerated, or gunshot, according to the kind of weapon with which they are inflicted. From the situation of the viscus, these injuries must always necessarily be complicated with lesion of the soft parts by which it is surrounded, and also not unfrequently with fracture of the pelvic bones.

The best example of an incised wound of the bladder is the incision made in the supra-pubic and recto-vesical operations for stone. In perineal lithotomy, the knife divides the prostate gland rather than the bladder. A good example of a punctured wound is afforded by the use of the trocar in drawing off the urine in cases of permanent retention from obstruction of the urethra.

The *symptoms* of this lesion are, the existence of an opening in the lower part of the hypogastric region, the groin, or the perineum; sudden and acute pain in the situation of the affected organ, extending along the urethra, and often accompanied by slight priapism; an escape of urine, or urine and blood, at the external wound; frequent, but ineffectual attempts at micturition; violent tenesmus; and a discharge of blood by the urethra. The system labors under all the effects of violent shock. When the injury is complicated with perforation of the bowel, fecal matter, mucus, bile, or gas, mixed with urine, or urine and blood, may issue both at the external opening and at the urethra. When the pelvic cavity is pierced, the state of collapse, the usual consequence of the accident, is speedily followed by symptoms of peritonitis, of which the patient almost always dies in a few days.

When the bladder is wounded through the perineum or above the pubes, at a point where it is uncovered by serous membrane, urinary infiltration is liable to take place, and the probability of the occurrence will be so much the greater if the external opening is disproportionately small, if the track of the wound is narrow and devious, and if the organ was much distended at the time of the accident.

Gunshot wounds of the bladder, although, perhaps, less fatal than punctured and incised, are always extremely formidable, destroying the patient immediately or remotely, producing extensive mischief among the soft parts, as well as in the pelvic bones, and leading to the formation of abscesses, sinuses, and fistules, which may last for an indefinite period. When the ball is impelled with great velocity, it will be apt to enter the organ at one point, and pass out directly opposite at another, thus leaving two apertures, and either lodging in the neighborhood, or issuing at the surface of the body. If, on the contrary, it move slowly, or be nearly spent, it will make only one opening, and be arrested in the bladder, from which it may afterwards be discharged by the urethra, or by a fistulous passage; or, what is more probable, it will become incrusted with earthy matter, and thus form the nucleus of a calculus. The lesion is often complicated with fracture of the pelvic bones, injury of the large vessels, and perforation of the rectum, small intestines, uterus, or vagina. In the former case, serious mischief is sometimes done by the osseous splinters which the ball makes and detaches in its course towards the bladder, and which not unfrequently find their way into the interior of this organ, where they may give rise even to more disastrous consequences than the ball itself. Wadding, pieces of cloth, or portions of the patient's dress, may accompany the ball

Gunshot wounds of the bladder, made with the old round bullet, were formerly frequently recovered from. Thus, Thomson states that, after the battle of Waterloo, he saw not less than fourteen cases, in which this viscus had been penetrated by musket balls, get well; and Larrey, who met with a number of instances of a similar kind in Egypt and Syria, declares that they generally terminated favorably. This, however, is not the experience of recent military surgeons, for wounds inflicted upon this organ by the Minié ball, nearly always cause death. Now and then, however, an exception occurs, as in the case of a young man, reported to me by Dr. J. F. Koerper. He was struck by two Minié balls, one of which entered the right buttock, nearly midway between the great trochanter and the sacral fissure, and emerged at the left groin, traversing apparently the lower part of the bladder, which had not been emptied for upwards of eight hours before. Urine began to issue at the gluteal wound soon after the accident, and for six days it passed off entirely by this route. It then gradually resumed its natural channel, but it was not until after the end of a month and a half that the fistulous track was finally closed. The man never had any bad symptoms. In a case mentioned by Dr. F. H. Hamilton, the individual had seven wounds, from three of which, made apparently by buckshot, all the urine escaped for ten days. It then ceased to pass off by the posterior openings, but continued to flow from the anterior for six weeks. The recovery was complete.

In the *treatment* of a wounded bladder, the prominent indications are, to prevent the extravasation of urine, and to guard against undue inflammation. Unfortunately, the first of these accidents often takes place at the moment of the injury, and, consequently, before the surgeon has an opportunity of interfering. When the reverse is the case, the bladder should instantly be evacuated, the patient placed almost semi-erect in bed, and the catheter, which should be of gum-elastic, should be permanently retained to allow the urine to pass off as fast as it comes down from the ureters. In a word, the organ should be kept constantly empty and contracted for the first few weeks, or until there is reason to conclude that the wound is closed and all risk of infiltration over. The end of the instrument should not be permitted to become clogged, or to rise up in the bladder. Care should also be taken that it does not irritate the mucous membrane, and thereby excite pain and spasm, rendering its presence uncomfortable, if not intolerable. Should the latter result, however, follow, the catheter must be withdrawn, and an attempt made to obviate the danger of distension by its frequent reintroduction.

Inflammation is prevented by the employment of antiphlogistic means, as general and local bleeding, calomel and opium, fomentations, and vesication of the abdomen. Anodynes are given in full doses, both by the mouth and by the rectum, to allay pain and spasm of the bladder, induce sleep, and diminish the renal secretion. Hardly any drink is admissible; the diet must be very light and bland, and the bowels must be disturbed as little as possible during the first fortnight. Abscesses, the result of urinary infiltration, are opened by early and free incisions.

Nothing can be gained by an attempt to extract the foreign body, when the injury has been produced by fire-arms; for the very moment it is inflicted the urine escapes, and the bladder contracts upon itself so as to destroy the relations between the external and internal wounds. If the ball has fallen into the bladder, it may, if not too large, either pass off spontaneously, or be removed with the forceps; should it be otherwise, and severe symptoms be caused by its presence, it must be cut out through the perineum by an operation similar to that of lithotomy. This may be done immediately, or within a short period after the accident, if the ball has entered beneath the pubes, for the reason that the organ will not only be freed thereby of a disagreeable intruder, but also because there will be less risk of urinary infiltration.

Mr. Dixon has published an analysis of 13 cases, in which the lateral operation of lithotomy was performed for the removal of bullets. Of these 10 were successful, and 3 fatal. Baudens, in a similar instance, relieved his patient by the supra-pubic operation.

Pieces of wadding, of cloth, and of bone, introduced into the bladder, either alone, or jointly with a ball, are occasionally voided by the urethra. More generally, however, if the patient survives the immediate effects of the accident, they are retained, and become the nucleus of a calculus.

When the bladder has been transfixed, or wounded through the peritoneum, the accident inevitably terminates fatally. In view of this event, would it be proper to make an incision through the linea alba, and sponge out the extravasated fluid? My opinion is that it would, on the ground that it would be much more creditable to a surgeon to perform such an operation, provided it can be done immediately after the injury has been received, than to stand by and see his patient perish from the effects of peritonitis. The only difficulty in the case might be the uncertainty of the abdominal effusion.

LACERATION.

The urinary bladder is liable to laceration. When the accident takes place from over-distension of urine from paralysis of the muscular fibres of the organ, hypertrophy of the prostate gland, or obstruction of the urethra, there is always some degree of softening of the different coats, thus predisposing them to the occurrence. In such a case, any unusual or sudden exertion may produce the effect.

The most common cause of laceration, however, is external violence, and it is worthy of remark, both in a surgical and medico-legal point of view, that it may occur from the most trivial injury. Any force suddenly applied to the hypogastric region, while the bladder is distended, as a smart blow, a kick, or a fall, will frequently suffice to produce it. The accident is liable to happen in females during parturition, from the pressure of the child's head, when the patient has neglected to empty the bladder. It may also be caused by fracture of the pelvic bones.

Of 37 cases of rupture of this organ from external violence, collected by Houël, 15 involved the posterior and 12 the anterior wall, 3 the sides, and 2 the summit; 3 were double, and in 2 the situation is not stated. Rupture of the posterior wall nearly always extends through the peritoneum, whereas in the other forms of the accident this membrane generally remains intact. In laceration of the front of the bladder, the urine, when the opening is large, escapes rapidly, and spreads widely beneath the peritoneum; sometimes as high up, on the one hand, as the umbilicus and the kidneys, and, on the other, as low down as the thigh, by passing through the obturator foramen.

In spontaneous rupture from over-distension, the bladder generally gives way in its posterior wall, without involvement of the peritoneum, and the consequence is that the urine accumulates under this membrane as in a kind of subsidiary pouch.

The injury usually reveals itself by well-marked *symptoms*, both general and local. Violent pain is instantly experienced in the hypogastric region, the face is pale and ghastly, the pulse is small, rapid, and fluttering, the respiration is hurried and difficult, the extremities are cold, and the surface is covered with a clammy perspiration. The patient occasionally falls down in a state of insensibility, and not unfrequently he feels as if something had suddenly given way in his abdomen. In nearly all cases, there is a constant desire to urinate, and an inability to pass a single drop of water. A small quantity of blood often flows off by the urethra. These symptoms are soon followed by nausea and vomiting, intense thirst, excessive restlessness, and an expression of great suffering, with swelling and tenderness of the abdomen.

Rupture of the bladder is nearly always fatal; usually in from three to six days after its occurrence. The immediate sources of danger are, hemorrhage, shock, peritonitis, and uremia, generally promptly collapsing the system.

The *treatment* must be conducted upon the same general principles as that of wounds of the bladder. Our only reliance is upon the catheter, anodynes, and stimulants.

INFLAMMATION.

Inflammation of the bladder, technically termed cystitis, generally begins in the mucous membrane, and presents itself under two varieties of form, the acute and the chronic. Of these, the first is exceedingly infrequent; the chronic form of the malady is, however, sufficiently common, and often entails a vast amount of suffering Acute inflammation rarely occupies the whole mucous surface of the bladder; on the contrary, it usually occurs in irregular, circumscribed spots, from the size of a twenty-five cent piece to that of the palm of the hand. Any portion of the organ is liable to suffer, but the parts most frequently affected are the neck and bas-fond.

During its progress, the inflammation often spreads from the mucous membrane to the subjacent cellular tissue, and from thence to the muscular tunic. The peritoneal investment is rarely implicated, in any considerable degree, however serious the attack.

The principal *causes* of acute cystitis are wounds of the bladder, calculous concretions, rough horseback exercise, the excessive use of stimulating drinks, enlargement of the prostate gland, stricture of the urethra, injury sustained during parturition, and the protracted retention of urine.

The more important anatomical characters of acute cystitis are, increased vascularity, loss of transparency, softening, deposits of lymph, and discoloration, with alteration of the natural secretion.

Generally speaking, the malady is ushered in by bold and well marked *symptoms.* The first circumstance that usually attracts attention is a dull, obscure, deep-seated pain, or, rather, a sort of gnawing uneasiness, in the region of the bladder, which, rapidly increasing in intensity, soon extends to the neighboring organs. At this early stage, there is little or no constitutional disturbance; or, if there is any, it is manifested merely by slight chills, alternating with flushes of heat, some thirst, and a little excitement of the pulse. The patient now begins to experience frequent calls to void his urine, which is expelled either in small quantities, or drop by drop, accompanied with violent straining, distressing spasm, and a peculiar scalding sensation at the neck of the bladder and along the course of the urethra. The hypogastrium is distended, painful, and so exquisitely tender as to render even the weight of the bedclothes intolerable. The limbs are drawn up, and the body bent forward, to relax the abdominal muscles, and relieve the tension of the bladder. The urine becomes thick, ropy, turbid, reddish, or tinged with blood; and the pain shoots along the testicles, groins, upper part of the thighs, and spermatic cords, to the sacro-lumbar region, where it is often almost insupportable. The urine, never entirely expelled, gradually accumulates, and the bladder at length ascends above the pubes into the hypogastrium, forming a globular and elastic tumor, exquisitely sensitive under the slightest touch.

When the disease is fully developed, there is always more or less constitutional derangement, as indicated by the frequency and hardness of the pulse, the anxious countenance, and the coated appearance of the tongue. Nausea and vomiting, with severe precordial oppression, are rarely absent in this stage of the complaint. Sometimes there is complete suppression of the urine.

Some diversity occurs in the symptoms of cystitis, dependent upon the particular seat of the morbid action. When the neck of the bladder is mainly affected, excessive pain and a sense of weight and fulness are experienced in the anus and perineum, there is obstinate retention of urine, with an incessant desire to micturate, and severe scalding is felt along the urethra. When the anterior wall of the bladder is inflamed, there is great tenderness on pressure and percussion, with a sense of constriction in the hypogastric region. When the disease occupies the bas-fond of the organ, the rectum is most apt to suffer, and the patient is harassed with constant straining and tenesmus.

Acute cystitis usually runs its course with considerable rapidity. It seldom continues beyond the sixth or eighth day without terminating in resolution, tending to suppuration, passing into gangrene, or assuming a chronic type.

In the *treatment* of acute cystitis, the leading indications are, first, to subdue symptomatic excitement; and, secondly, to quiet local irritation. For accomplishing the first of these ends, the remedies mainly relied upon, in the incipient stages of the complaint, are general and topical bleeding, aperients, and diaphoretics, aided by an antiphlogistic regimen. The bowels should be early moved by some mild laxative, as castor oil, or sulphate of magnesia, followed by an enema of cold water, thin gruel, or soap and water. If the biliary and other secretions are deranged, a dose of calomel should be given. All drastic cathartics must be avoided to divert irritating matters from the kidneys.

As soon as proper depletion has been practised, diaphoretics are indicated, and the one which I have found most useful is the antimonial and saline mixture, in union with full doses of morphia and aconite. Dover's powder is beneficial when the skin is already soft. If the stomach is irritable, the effervescing draught is preferable to everything else. The action of these medicines may be favored by tepid drinks, the warm bath, and hot fomentations to the hypogastrium and genitals. Diuretics, strictly so called, are improper. When the urine is acrid, high-colored, or very scanty, a small quantity of nitrate of potassa, or spirit of nitric ether, mixed with some demulcent fluid, may be administered, to modify the renal secretion and to allay vesical irritation. In the latter stages of the disease, an infusion of uva ursi and hops, in the proportion of one ounce of the former and half an ounce of the latter to the quart of water, will prove highly advantageous, especially if combined with morphia and bicarbonate of soda.

Among the more important local remedies for arresting cystitis, and tranquilizing the affected organ, are leeching, anodyne enemata or suppositories, fomentations, and the hip-bath. The pain in the back is relieved by cups, either wet or dry, applied to the sacro-lumbar region. Certain modifications of treatment are made, according to the nature of the exciting cause of the disease. Retention of urine is promptly relieved by the catheter.

SUPPURATION AND ABSCESS.

A discharge of pus, or muco-purulent fluid, from the lining membrane of the bladder, although sufficiently common in chronic cystitis, is infrequent in the acute form of the disease. The discharge, moreover, is usually of brief continuance, and small in quantity, while in chronic cystitis it often lasts for a long time, and is occasionally remarkably profuse.

The matter, instead of being furnished by the free surface of the mucous membrane, occasionally presents itself in the form of a small *abscess*, situated in the submucous cellular tissue, or between the muscular and serous tunics. It may occur in any part of the viscus, but is most frequently observed at its neck, as a solitary deposit. In the great majority of cases, the abscess points inwards towards the cavity of the bladder, but it may also open into the rectum, the sigmoid flexure of the colon, the ileum, the vagina, or the abdominal cavity. Finally, the matter is sometimes diffused through the cellular tissue of the coats of the bladder, which, in consequence, exhibit a soft, œdematous aspect.

Suppuration of the bladder may be the result of idiopathic inflammation, either acute or chronic, external violence, or the presence of some foreign body, as a calculus, bougie, or catheter. In the latter case, abscesses are generally produced under the influence of protracted irritation, operating directly upon the tunics of the organ.

The occurrence of suppuration is always denoted by well-marked symptoms. The most important are frequent rigors, alternating with flushes of heat; an increase of thirst, anxiety and restlessness; dull, aching, throbbing pain; and a feeling of weight in the perineum and pelvis. The mind generally wanders, and, in many cases, there is confirmed delirium. These symptoms, however, may be simulated by other diseases, both of the bladder and of the neighboring organs. In abscess, the diagnosis is sometimes determined by the sudden appearance in the urine of a large quantity of pus, after a violent effort at micturition, or an attempt to draw off the urine. Infiltration of pus into the coats of the bladder cannot be distinguished during life.

The prognosis of suppuration of the mucous membrane of the bladder is usually favorable; the reverse being the case in abscess. Much, however, must necessarily, under such circumstances, depend upon the nature and extent of the injury.

The treatment of this disease is to be conducted upon general antiphlogistic principles in its earlier stages, and, subsequently, upon the tonic and invigorating plan. If abscesses point externally, they must be opened with the knife.

GANGRENE.

Acute inflammation of the bladder sometimes ends in gangrene. This mode of termination, however, is fortunately infrequent, as the morbid action which gives rise to it is generally easily arrested by the early and vigorous employment of antiphlogistic remedies. It is particularly to be apprehended when the cystitis is marked by great violence, when it has been induced by external injury, and when it occurs in old persons, whose health has been much impaired by previous suffering.

Gangrene of the bladder, although it may occur as a consequence of idiopathic inflammation, is almost always a result of external violence or over-distension of the organ from urine. One of its most common causes is compression of the viscus during the passage of the child's head in parturition. Gangrene occasionally follows the operation of lithotomy, and laceration of the mucous membrane consequent upon the employment of instruments.

The occurrence of mortification of the bladder is announced by great prostration of strength; sudden cessation of pain; coldness of the extremities; small, weak, frequent, and tremulous pulse; profuse, clammy, and offensive perspiration; cadaverous expression of the countenance; mental confusion, delirium, and coma; hiccup; twitching of the tendons; and, towards the close, by colliquative diarrhœa and involuntary discharge of the feces. The urine is of a dark brownish, or blackish color, emits a peculiarly fetid, sickening odor, and is effectually retained by the dead, crippled, or paralyzed organ. On dissection, the mucous membrane is found to be of a dark red, livid, or purple complexion, very soft, easily torn, and bathed with a thin, sanious fluid, of an excessively fetid odor.

Gangrene of the bladder is sometimes followed by a rupture of the coats of this organ, and the escape of its contents. This event is most likely to happen when there has been protracted retention of urine, with inordinate distension, and may take place very suddenly, or slowly and gradually, as a result of ulceration. Whether the urine escapes into the cavity of the abdomen, or into the cellular tissue of the pelvis, death is equally inevitable.

The *treatment* of this affection is easily told. The object is to prevent the lesion rather than to cure it after it has been established. Should gangrene be inevitable, the indication is to support the system, and, by means of quinine, ammonia, brandy, opiates, and nutritious food, assist the patient in throwing off the effects of the local disorder. Distension of the bladder is obviated by the catheter.

ULCERATION.

Ulceration of the bladder is uncommon. Judging from the results of my own observations, I am disposed to rank it amongst the rarest accidents to which this organ is obnoxious. The ulcers are usually neither numerous nor large. Their most common appearance here, as in the bowels, is that of depressed breaches of continuity of the mucous membrane, of a circular or oval form, with slightly elevated edges. Occasionally, the edges are hard, thick, fissured, and puckered. Appearances like these are most common in old, chronic cases. The bottom of the erosion is originally formed by the submucous cellular substance; but as the disease progresses it may destroy the muscular fibres, and even the serous investment, leading, perhaps, eventually to perforation, and to the escape of urine into the abdominal cavity. Or, instead of this, adhesions may take place between the bladder and the neighboring viscera.

In the great majority of instances, the ulceration may be distinctly traced to chronic cystitis. Paralysis of the bladder, injury of the spinal cord, and organic lesion of the kidneys, are very apt to induce the affection, from the changes which they create in the composition of the urine. Calculous concretions and earthy deposits often occasion ulceration solely by the pressure which they exert upon the mucous membrane. Sometimes the disease is the result of the softening of tubercular matter, and then the muscular fibres are occasionally as completely denuded as if they had been dissected with the knife.

The *symptoms* of ulceration of the bladder do not differ essentially, in the early stage of the disease, from those of subacute or chronic inflammation. Even at a later period, they are not always well marked. The most prominent local phenomena are pain and uneasiness in the pelvis, with spasm, frequent micturition, and an offensive state of the urine. The pain is of an acute, burning, or scalding character. The inclination to micturate is not incessant, but comes on in paroxysms, which gradually increase in frequency, and are attended with intense suffering. The urine is commonly acid, slightly albuminous, voided in small quantity, and loaded with thick, ropy mucus, which, as the fluid cools, adheres firmly to the bottom of the chamber-pot. As the destruction of the lining membrane proceeds, the mucus gradually diminishes, and finally almost entirely disappears. In the advanced stages of the complaint, the fluid is excessively offensive, of a dark color, occasionally like coffee-grounds in appearance, and often mixed with pus, blood, shreds of lymph, and even the débris of the affected membrane. An ammoniacal state of the urine is not uncommon at this period.

As the disease progresses, the sympathies and functions of the urinary organs are completely subverted, and the patient's health is materially impaired by the local derangement. Sometimes, however, on the other hand, the symptoms are comparatively mild, and but little distress is experienced in the urinary apparatus. This is more particularly liable to happen when the disease is of a tubercular character.

The *diagnosis* of this disease is difficult, and cannot always be determined during life. The affections for which it is most liable to be mistaken are simple cystitis, catarrh, and stone. From the first, it may generally be distinguished by its obstinate persistence, by the greater extent and violence of the local distress, by the incessant desire to void the urine, by the more frequent recurrence of spasms, by the more severe burning or scalding along the urethra, and, lastly, by the presence of pus in the urine, and, in the more aggravated forms of the complaint, by the absence of mucus. In catarrh, the characteristic symptom is a copious secretion of thick, tough, ropy mucus, with a turbid appearance and an ammoniacal smell of the urine. The local and constitutional distress are less severe than in ulceration, the desire to micturate is not so frequent, there is less sensibility of the urethra, and there is often complete intermission of the vesical disturbance, the patient remaining comparatively comfortable for days and weeks. In ulceration, the symptoms are persistent, the disease steadily proceeding from bad to worse.

In stone, the pain is most severe immediately after passing the urine, and is generally much aggravated by rough exercise; the urine is more frequently bloody; there is less irritability of the urethra; and the intervals between the paroxysms are longer than in ulceration. If doubt exists, the sound is used, cautiously and gently, lest, if the case be one of ulceration, it increase the local inflammation, and thus endanger life.

In ulceration there is sometimes a discharge of the débris of the mucous membrane, which never happens in simple cystitis, catarrh, and calculous disorder. The pain also is much greater, and the desire to pass water more frequent.

When perforations exist, a discharge of gas, fecal matter, ingesta, and other substances, along with the urine, leaves no doubt respecting the nature of the disease.

The *treatment* of this complaint is most unsatisfactory. At its commencement the means employed to arrest it must be strictly antiphlogistic. Active depletion by the lancet will, however, seldom be called for after the expiration of the first fortnight, while the local abstraction of blood by leeches is proper in every stage of the disorder, and constitutes, indeed, one of our most valuable therapeutic resources. The bowels should be kept in a soluble condition, but active purgation is injurious. The diet should be light and nutritious, consisting chiefly of bread, toast, potatoes, rice, hominy, and mush, with weak tea at breakfast and supper. The patient should constantly wear flannel next the skin, and carefully guard against sudden vicissitudes of temperature. Sexual intercourse, and rough exercise of every description, must be carefully avoided.

Of the internal remedies calculated to act directly upon the urinary apparatus, the most important are, balsam of copaiba, uva ursi, hops, cubebs, hyoscyamus, bicarbonate of soda, mineral acids, and tincture of the chloride of iron, either alone, or variously combined. Anodynes, in full doses, are indispensable for quieting the bladder, and procuring sleep.

Local remedies, or means addressed directly to the affected surface, are sometimes highly serviceable. The best undoubtedly are such as are of an anodyne character, as infusion of poppy, opium, hop, aconite, and cicuta, or tepid water, either simple or medicated with tar, tannin, sulphate of zinc, creasote, nitrate of silver, and other substances. Lime-water, black wash, and a weak solution of iodine have occasionally proved advantageous. The best mode of introducing them is by means of a gum-elastic bag, carefully adapted to the end of a medium-sized silver catheter. The quantity of any injection should not exceed, at first, an ounce and a half. An anodyne injection should be retained as long as possible; an astringent one not more than a few minutes.

Counter-irritation, in the form of issue, seton, or pustulation with tartar emetic, is often advantageous in this affection, and should be resorted to as early as practicable.

CHRONIC INFLAMMATION, CATARRH, OR CYSTORRHŒA.

Catarrh of the bladder, technically denominated cystorrhœa, signifies an inordinate secretion of white, glairy mucus, essentially dependent upon chronic inflammation of the lining membrane. It is analogous in its character to gleet, leucorrhœa, and kindred affections, and is generally merely a symptom of a more serious disease. It may occur at any period of life, but is most common in elderly subjects.

The immediate cause of cystorrhœa is always some obstacle to the evacuation of the urine, or a diseased condition of the bladder. Hence, it is most commonly observed as an effect of stricture of the urethra, vesical calculus, and enlargement of the prostate gland. Paralysis of the bladder, whether produced by over-distension of the organ by urine, or injury of the spine, frequently gives rise to it. Cystorrhœa is a constant attendant upon sacculation, ulceration, hypertrophy, and carcinoma of the bladder. When the affection is once established, it is easily aggravated or reinduced by exposure to cold, excesses in diet, irritating injections, diuretics, over-distension of the bladder, neuralgia, retrocession of gout, repulsion of cutaneous eruptions, local injury, and disease of the adjoining parts, as the anus, rectum, vagina, and uterus.

Cystorrhœa generally comes on in a slow, gradual, and insidious manner. The inflammation which accompanies the affection, and which is always the immediate cause of the peculiar discharge, is of a chronic character, and, in the first instance, of a very mild grade. It is for this reason that the term subacute has sometimes been applied to it.

The *symptoms* of the disease vary. The characteristic one is an inordinate secretion of mucus. This is nearly always associated with an altered condition of the urine, frequent and difficult micturition, pain in the region of the affected organ, as well as in the adjoining parts, and more or less constitutional derangement.

The quantity of mucus that is mixed with the urine varies remarkably in different cases and under different circumstances. In the incipient stages, and in the milder forms of the affection, it is generally small, not exceeding, perhaps, a few drachms in the twenty-four hours. At a more advanced period, the quantity is often considerable, and in some instances it is truly enormous.

During the progress of the disease the urine always becomes highly acrid, so that the bladder can hardly tolerate its presence, even for a few minutes. It generally emits an ammoniacal odor, is rapidly decomposed, both in and out of the bladder, and is nearly always mixed with purulent and phosphatic matter. If a silver catheter is used late in the disease, it usually comes out of a bronze, brownish, or black color, in consequence of the presence of a minute quantity of sulphuretted hydrogen.

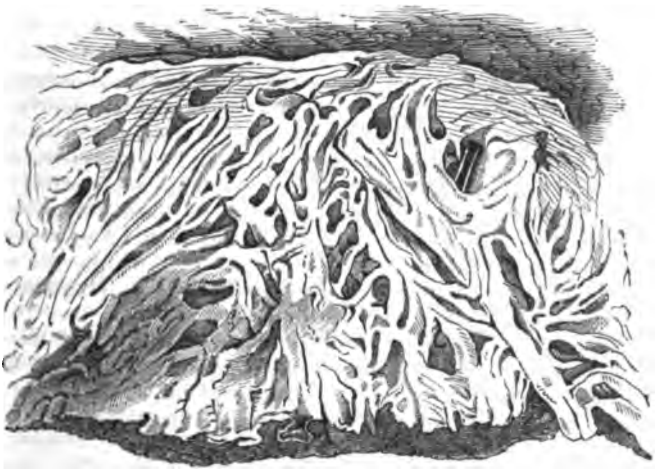
The pus that is formed in this disease may proceed from various sources, as the bladder, ureters, prostate gland, and, even the kidneys, which are often seriously involved in the mischief. Its presence is always to be regarded with great attention, as it is commonly indicative of serious disease of the organs from which it is derived. The urine is voided frequently, in small quantity, and with more or less difficulty. Generally it passes off in interrupted jets, in a small, feeble, stream, or in drops, accompanied by violent spasm and straining. When it is loaded with thick, ropy mucus, the difficulty of voiding it is much increased, and the patient is obliged to have frequent recourse to the catheter.

The *diagnosis* of this disease is always easy. Almost the only affection with which it is liable to be confounded is seminal emission; but this can happen only when this fluid flows into the bladder, and mixes with the urine, in consequence of stricture of the urethra, or enlargement of the prostate gland. The distinction is that, in catarrh, the discharge is always greater and more constant, and also more ropy, tenacious, and offensive, the local suffering is more severe, and there is a more frequent desire to micturate. In seminal disease, the matter is voided in small quantity, and at remote intervals; it has a peculiar odor, is of a light color, and is partially insoluble in water, in which it floats in shreds. When there is any doubt, the best plan is to subject a few drops of the suspected fluid to microscopical examination. If it be seminal, it will be found to contain spermatozoa, small oblong bodies, with delicate, tapering tails.

The *prognosis* in cystorrhœa varies with many circumstances which hardly admit of precise detail. Much will necessarily depend upon the age and constitution of the patient, the duration of the disease, and the condition of the bladder and of the associated organs. In its incipient stages it is sometimes not difficult of cure; but when, commencing gradually, it has at length come to disorder the whole system, it rarely terminates favorably.

The *morbid alterations* are variable. In the early stage, and in the milder forms of the disease, the mucous membrane usually presents slight marks of inflammation, with little or no lesion of the other tunics. After some time, how-

Fig. 453.



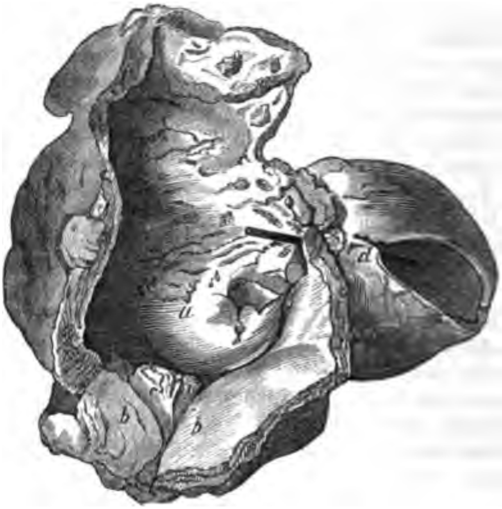
Columniform bladder.

ever, the muscular fibres become hypertrophied, and exhibit the peculiar retiform arrangement delineated in fig. 453, from a specimen in my collection. Occasionally a large bar-like ridge lies just behind the neck of the bladder, offering a considerable obstacle to the passage of the catheter.

The cellulo-fibrous lamella is also much thickened, as well as increased in density, and the mucous membrane, particularly the portion which corresponds with the bas-fond of the organ, is often thrown into large, heavy ridges. In some instances the lining membrane is ulcerated, covered with patches of lymph, or protruded across the muscular fibres, in the form of one or more pouches. The walls of the bladder are frequently from five to ten times the natural thickness. The kidneys, ureters, and prostate gland, are generally implicated in the mischief; sometimes to a fatal extent.

The sacculated appearance of the bladder, which so often accompanies chronic inflammation, is well shown in fig. 454, from a preparation in my private cabinet.

Fig. 454.



Section of the bladder and prostate. *a.* Mucous surface of the bladder. *b, b.* Lateral lobes of the prostate. *c.* Middle lobe. *d.* Large cyst or pouch, partially laid open, and communicating with the bladder by a small orifice.

It is formed by a projection of the mucous coat across the hypertrophied muscular fibres, and varies in size, from a pigeon's egg to a cavity nearly as large as the bladder itself. It always contains urine, and, occasionally, also calculi.

In a case of sacculated bladder, in a man, aged eighty-four years, reported by Professor W. W. Greene, of Pittsfield, the adventitious pouch contained nearly one gallon of limpid urine, and was so large as to encroach very seriously upon the abdominal viscera. The opening of communication was four inches from the neck of the bladder, and was eighteen lines in diameter, with smooth, well-defined edges. The bladder was greatly hypertrophied, and the prostate gland was fully as large as a common orange.

In entering upon the *treatment* of this affection, it is of great importance to ascertain the nature of the exciting cause. If there is stricture of the urethra, stone in the bladder, hypertrophy of the prostate gland, or disease of the neighboring and associated organs, no permanent relief can reasonably be hoped for until these affections are removed.

It would be useless to repeat here what has already been said in other portions of the work, respecting the employment of antiphlogistics. They are imperatively demanded in all cases attended with violent pain and frequent micturition, even when there is no marked constitutional disturbance. When the lancet is inadmissible, from twenty to thirty leeches may be applied to the perineum and inside of the thighs, or to the lower part of the hypogastric region. The topical bleeding should be followed up with the warm bath, warm fomentations, and warm enemata. The bowels must be opened with saline cathartics, or, when the secretions are much deranged, with calomel and jalap. All articles tending to irritate the rectum should be carefully avoided. The most perfect quietude, both of mind and body, must be enjoined; the diet should be as light and unirritant as possible; and the patient should be requested to make free use of demulcent drinks, as gum Arabic water, flaxseed tea, or slippery elm water.

When, by these means, the violence of the disease has been subdued, I know of no remedy so well calculated, in ordinary cases, to ameliorate the morbid condition of the bladder as balsam of copaiba. It should be given in doses not exceeding ten, fifteen, or twenty drops, three or four times in the twenty-four hours. The best form is that of emulsion. Its nauseating, griping, and purging tendencies should be counteracted by laudanum or morphia. When the patient is troubled with pyrosis or acid eructations, the medicine may advantageously be conjoined with bicarbonate of soda.

The terebinthinate preparations are sometimes highly beneficial in this affection. Pareira brava and buchu have also been much extolled, but I have never derived much advantage from them. Uva ursi has likewise a specific tendency to the urinary organs. I have found it particularly serviceable in cases attended with excessive morbid sensibility of the neck of the bladder. It may advantageously be combined with buchu and lupuline, and, in the class of cases just mentioned, with carbonate of soda and potassa.

A combination of some of these articles may often be advantageously employed. Indeed, the effect is usually much more conspicuous when they are given in this manner than when they are used separately. I have long been in the habit of administering, with the happiest effect, a combination of buchu, uva ursi, and cubebs, sometimes in the form of infusion, but more generally in that of tincture, given several times a day, in conjunction with a small quantity of bicarbonate of soda. Occasionally, a few drops of balsam of copaiba, tincture of chloride of iron, or dilute nitric acid, may advantageously be added to each dose of these medicines. The iron, given by itself, sometimes answers an excellent purpose. When the disease is associated with a gouty or rheumatic state of the system, colchicum should be employed, and the best form of exhibiting it is in union with a full anodyne. Benzoic acid sometimes affords relief when everything else fails.

In all cases of vesical catarrh, the urine should be subjected to the usual tests. If it be found to be acid, the carbonated alkalies should be freely exhibited, and acids if it be alkaline.

To allay pain and induce sleep, anodynes are indispensable in almost every stage of this disease. They should be given in full doses, either alone or with other medicines.

Counter-irritation, in the form of issue, seton, or tartar-emetic pustulation, is often highly beneficial, and should never be neglected in obstinate cases. Blisters, except at the commencement of the complaint, or when there is a sudden aggravation of the discharge, seldom afford much relief. In truth, it is doubtful whether their beneficial effects are not fully counterbalanced by the injurious impression which they sometimes make upon the neck of the bladder, leading to an increase of the local suffering.

The remedies addressed directly to the suffering organ itself are irrigations, astringent and other injections, and cauterization.

Irrigation of the bladder is sometimes employed in the treatment of vesical catarrh, and is, in many cases, a valuable auxiliary to the other means already pointed out. It is particularly serviceable when there is an abundant discharge of thick, tenacious mucus, attended with atony of the muscular fibres of the bladder. The operation is performed with tepid water, injected with a large syringe through a double catheter.

Fluids of various kinds, astringent, anodyne, and alterant, are sometimes introduced into the bladder, for the purpose of making a direct impression upon the inflamed surface. The articles most commonly resorted to are alum, zinc, copper, iodine, nitrate of silver, creasote, opium, morphia, laudanum, cicuta, bichloride of mercury, and nitric acid.

Cauterization with the solid nitrate of silver is occasionally used. I have tried it in a number of instances, but without any decided benefit. It is chiefly applicable to those cases in which the catarrh is dependent upon inflammation of the neck of the bladder, and should be employed with the greatest possible caution, lest it aggravate the morbid action.

In obstinate cases of cystorrhœa, when all other remedies have failed to afford relief, it has been proposed to penetrate the neck of the bladder by means of an incision, similar to that made in the lateral operation of lithotomy. The object is to afford a free outlet to the mucous secretion as fast as it takes place, and to put the organ thereby in a state of repose. The proposal is plausible, but has not been sufficiently tested to enable us to form a definite opinion in regard to its value.

Finally, in the management of this affection, the utmost attention must be paid to the diet, which should always be of a light, farinaceous character. Between the paroxysms, or when convalescence is fairly established, animal broths, and a little of the lighter kinds of meat, may be used. But neither at this, nor at any previous period, are condiments admissible. Even salt should be employed most sparingly. Vegetable acids, subacid fruits, wine, spirits, and fermented liquors are prejudicial. The best drink is cold water, either alone or with good Holland gin.

Exposure to cold must be carefully avoided. Flannel is worn next the skin, both summer and winter; riding on horseback is interdicted; sexual intercourse is abstained from; and the bladder is, for a long time, emptied daily at stated intervals.

When the kidneys, ureters, and prostate gland are seriously affected no remedy has the power of checking this distressing malady. All that can be done is to enjoin perfect tranquillity, a light but generous diet, anodynes by the mouth and rectum, the warm bath, and attention to the bowels.

IRRITABILITY OR MORBID SENSIBILITY.

The characteristic symptom of this disease is frequent micturition. The urine is voided every few hours, perhaps, indeed, every few minutes, and the process is commonly attended with more or less pain, spasm, and burning at the neck of the bladder and along the urethra. The fluid may be perfectly natural, both in its physical and chemical properties; or it may be increased or diminished in quantity, and variously altered in quality. In general, it is acid, high-colored, and surcharged with mucus, of a whitish or grayish complexion. The urethra and the prostate gland are usually unnaturally sensitive to the touch, and a very common accompaniment of the affection, especially in young men, is a tendency to erections and seminal discharges. In time, the general health, perhaps originally good, gradually suffers. The disease is most frequently met with in children and youths of a nervous, irritable disposition. It is also sufficiently common in persons who are predisposed to attacks of gout and rheumatism.

Irritability of the bladder may be arranged under different heads, according to the *causes* by which it is induced, as—1st. Disease of the urinary apparatus. 2d. Altered state of the urine. 3d. Diuretic medicines. 4th. Disorder of the genital organs. 5th. Derangement of the alimentary canal. 6th. Lesion of the brain and spinal cord. 7th. General debility. 8th. Exposure to cold and heat. 9th. Disease of the pelvic viscera.

The *pathology* of this disease is not well understood. The most plausible conclusion, perhaps, in the absence of facts, is that the complaint consists in an exaltation of the nervous sensibility of the mucous membrane, similar to that which is occasionally witnessed in the retina, the fauces, urethra, and other mucous canals. When the disease depends upon local causes, as stone in the bladder, stricture of the urethra, or enlargement of the prostate gland, the anatomical changes are more distinct, and afford a more satisfactory solution of the real nature of the case. Very frequently the irritability is purely sympathetic.

The *prognosis* is variable. The idiopathic form of the complaint, although frequently very obstinate, generally, after a time, yields to a well-directed course of treatment. When the disease occurs in weak, scrofulous subjects, it is always remarkably refractory. The irritability of the bladder of young children, attended with nocturnal incontinence of urine, sometimes disappears spontaneously towards the approach of puberty. When dependent upon local causes, of a curable nature, relief may generally be obtained.

In the *treatment* of this complaint, so Protean in its character, a strict inquiry should, in every instance, be instituted into its origin, and the practice be regulated accordingly.

When the irritability depends upon congestion or inflammation, the application of leeches to the perineum, the hip-bath, and, in plethoric subjects, venesection, are indicated. Purgatives, rest, low diet, the internal use of balsam of copaiba, anodyne injections, and demulcent drinks, should not be neglected.

If the disorder depend upon an acid state of the urine, alkalies will be indicated, and the one which I usually prefer is bicarbonate of soda, either alone, or in union with bicarbonate of potassa.

If the patient is of a rheumatic or gouty habit, colchicum will be useful, especially if given in combination with morphia and spirit of nitric ether. The best form of exhibition is the wine, in the dose of one drachm every night at bedtime.

When the disease has been induced by the improper employment of diuretics, a discontinuance of the remedies, and the use of demulcent drinks, the hip-bath, hot fomentations, and a full anodyne by the mouth or rectum, will, in general, put a speedy stop to it.

All venereal excesses must be abandoned, and means taken to improve the disastrous effects produced by them. Of these, the most important are quinine and the chalybeate tonics, blue mass and rhubarb as a purgative, a light but nutritious diet, cold ablutions, the cold shower bath, and exercise in the open air. If spermatorrhœa be present, nothing short of cauterization will be likely to answer. In this form of irritability of the bladder, good effects sometimes result from the exhibition of bromide of potassium, in doses of five to ten grains thrice in the twenty-four hours.

When the irritation has arisen from disorder of the digestive organs, particular attention should be given to the correction of the secretions; the diet should be carefully regulated, and the bowels should, from time to time, be duly evacuated. If symptoms of worms be present, anthelmintics are indicated, of which calomel, spirits of turpentine, and chenopodium are the most valuable. In those forms of the complaint which are dependent upon piles, ulcers, fistule, and other organic changes of the rectum and anus, there can, of course, be no hope of relief without striking at the root of the evil. Tumors must be removed, ulcers cauterized or incised, and sinuses laid open.

Within the last few years carbonic acid gas has been a good deal employed as a local sedative in this complaint, and there is no doubt that it occasionally exerts a very happy influence in relieving pain and checking the disposition to frequent micturition, the effect being sometimes more anodyne than that of strong opiates, while it is destitute of the disagreeable consequences which so often follow the exhibition of the latter articles.

Irritability of the bladder, dependent upon lesion of the brain and spinal cord, must be treated upon general principles.

In that variety of vesical irritability which is so common in young girls, at or soon after the age of puberty, and which is probably of a mixed character, depending partly upon spinal irritation, and partly upon disorder of the uterine functions, much benefit will be derived from a proper regulation of the bowels, chalybeate tonics, particularly Griffith's mixture, Plummer's pills, the shower-bath, and daily exercise in the open air. In protracted cases, the uterus should be examined, as the cause may depend upon displacement of that organ.

When the disease has been caused by general debility, the patient
upon an invigorating diet, nutritious drinks, and tonics.

If the disease has been induced by cold, and the patient is robust
venesection, carried to syncope, will generally afford prompt relief,
it be aided by diaphoretics, as a combination of antimony and morphia,
powder, brisk cathartics, anodyne injections, and hot fomentations.

The neuralgic form of the disease is best controlled by quinine,
and arsenic, in union with morphia and aconite. Sometimes prompt
afforded by wine of colchicum.

NEURALGIA.

Neuralgia of the bladder is a nervous affection, characterized by sev
ing, which is generally referred to the neck of the organ, and is
paroxysmal in its attacks, recurring daily or every other day, about
period, usually early in the evening or towards morning. The attack
their duration from two to six hours, and the suffering is often of the
ing and agonizing nature. The pain is reflected to the neighboring
is accompanied with a sensation of heat and burning in the urethra,
quent desire to pass water, the urine being thrown out in jets, or in a
perhaps, interrupted stream. The paroxysm gradually goes off, leaving
inconvenience than a feeling of soreness or aching in the neck of the
perineum, and posterior part of the urethra. The general health
becomes affected. In obstinate cases there is also a thin, gleety dischar
great soreness in the perineum and hypogastric region. The urine is
always natural.

The *diagnosis* is not always very clear. The attacks, especially
severe, bear the closest resemblance to the paroxysms produced by a
concretion. Hence, in doubtful cases, sounding of the bladder is advisa

Of the *causes* of vesical neuralgia very little is known. In general,
they are wholly inappreciable. The disease is observed, for the most
persons of a nervous temperament. Venereal indulgences, masturbation,
ture of the urethra, stone in the bladder, and organic disease of the uteru
and rectum, are all capable of producing it. What influence miasm may
upon its development is not ascertained, but it is doubtless a very frequent
of the complaint.

Vesical neuralgia, although an exceedingly painful and distressing di
seldom terminates fatally. Its long continuance, however, or its frequent
rence, may render the patient miserable for life.

The *treatment* must be regulated by the nature of the exciting cause.
it is connected with an inflammatory state of the system, prompt and
blood-letting is the proper remedy, especially at the commencement of the
Purgatives are particularly useful when the affection is dependent on the
of miasm, and should be administered in doses adequate to procure free
tions. If the tongue is much coated, the best article will be calomel,
by castor oil. A blue pill, given every other night, after this, will serve
the bowels in a laxative condition.

When the disease is plainly of a miasmatic character, the most
remedy is quinine, administered in doses of five grains every five hours
twenty grains have been taken. It should then be discontinued until the
day, when it should be resumed, and persevered in until the same quantity
been used. By this time the paroxysm will usually have abated very much
violence, if it has not altogether subsided. When the disease has been
moderated, the best medicines to eradicate it are arsenic, strychnia, and
in union with morphia.

During the violence of the paroxysm, large doses of narcotics are frequen
indispensable. Of these, the most efficacious are the salts of morphia, eith
alone, or combined with nauseants, and tincture of aconite, according to
state of the vascular system. An emetic of ipecacuanha at the approach of

attack will sometimes cut it short. Much benefit will also acrue, in many cases, from the use of the warm bath. In persons of a gouty, rheumatic habit, no remedy will be so likely to be successful as colchicum.

In the more aggravated and intractable varieties of the malady, recourse must be had to counter-irritation over the perineum, the supra-pubic region, the sacrum, or the inner part of the thighs. The best forms are the moxa and the caustic issue.

When the neuralgia depends upon stricture of the urethra, foreign bodies in the bladder, hemorrhoids or other disease of the anus, none but the most transient amelioration can be expected from any mode of treatment, until these causes have been removed

The strictest attention should be paid to the diet. Everything calculated to disorder the digestive apparatus, and induce acidity and flatulence, should be avoided. When indigestion prevails, carbonate of soda may be resorted to, either alone, or, what is better, combined with some of the simple tonics, such as columba, gentian, hop, or cascarilla, in infusion. Occasionally, great relief follows the use of large doses of subnitrate of bismuth.

Exposure to cold is avoided; flannel is worn next the surface; sexual intercourse is refrained from; and all sources of irritation are removed.

GOUT AND RHEUMATISM.

The bladder, like the stomach, bowels, heart, kidneys, and other organs, is liable to gout and rheumatism, either as original and independent affections, or, as is more commonly the case, as consequences of the translation of these diseases from some other structures. Thus, it not unfrequently happens that a man who has gout or rheumatism of the foot or knee, will, during the progress of the attack, be seized with gout or rheumatism of the bladder. Sometimes the vesical malady comes on so suddenly, and at the same time such a degree of relief is experienced at the original seat of the affection, as to leave no doubt that the attack consists merely in a transfer of morbid action from one place to another.

Although these affections may occur at any period of life, even in very young children, they are most common in elderly subjects, especially in males who have long been addicted to all kinds of excesses in eating and drinking, and whose constitution has been still further impaired by repeated attacks of gout and rheumatism in other parts of the body. Women suffer less frequently than men, simply, perhaps, because they are not so frequently exposed to the exciting causes of the diseases.

An attack of vesical gout or rheumatism is generally brought on under the influence of cold, disorder of the digestive organs, over-stimulation, want of exercise, or inordinate venereal indulgence. Occasionally it is provoked by stricture of the urethra, enlargement of the prostate gland, disease of the kidneys, the presence of a vesical calculus, or an acrid state of the urine. It may also be induced by organic disease of the uterus, vagina, anus, and rectum.

The *symptoms* are very similar to those which attend neuralgia. The bladder is not only excessively irritable, with a constant inclination to expel its contents, but more or less painful and tender on pressure. The suffering is most severe in the pelvic region, from which, however, it radiates about in different directions, especially into the lumbar region, in the course of the spermatic cords, down the thighs, and around the anus and perineum. Occasionally a good deal of fever is present, but cases occur in which there is not the slightest arterial excitement or other evidence of pyrexia. The tongue, however, is generally considerably coated, the appetite is impaired, and the bowels are constipated. Marked alteration always exists in the urine. Most commonly the fluid is very scanty, of high specific gravity, and of a smoky aspect, from the presence of lithic acid, renal casts, and a redundancy of mucus. In some cases, the secretion, instead of being acid, is highly alkaline, ropy, putrescent, albuminous, or even purulent.

When the muscular coat of the bladder is seriously involved in the disease, retention of urine is apt to occur.

The *diagnosis* of these diseases is sometimes very difficult. The affections with which they are most liable to be confounded are neuralgia and spasm of the bladder, however induced. The most important signs of distinction are the mode of the attack and the presence or absence of similar suffering in other parts of the body. If the vesical seizure occurs while a man is laboring under an attack of gout or rheumatism in a joint, it may fairly be assumed that it is of a similar character, and this conclusion will be greatly strengthened if, soon after the vesical seizure, the articular one is either very much relieved, or completely dispelled. In doubtful cases, a careful examination should be made of the urine. Much difficulty will often be experienced in distinguishing between gout and rheumatism of the bladder, although, practically speaking, this is really a matter of very little moment. It should be borne in mind also that the symptoms of these diseases are sometimes closely simulated by stone in the bladder.

The *prognosis* is generally favorable. The vesical disease may, it is true, last, with various intermissions, for a long time, but, in the end, it will usually be found to be amenable to treatment.

In the *treatment* of these affections, so closely allied in their nature and origin, our principal reliance must, in the first instance, be upon purgatives, both with a view to their evacuant effects, and the correction of the secretions, and afterwards upon colchicum, aided by anodynes and alkalies. When the violence of the attack has been considerably abated great benefit will generally accrue from the steady use of Dover's powder, opiate suppositories, and sinapisms to the hypogastrium and sacro-lumbar region. If the patient is robust and plethoric, blood may advantageously be taken from the arm, while, if the reverse be the case, the exhibition of tonics and stimulants will be indicated. The diet must, of course, be properly regulated, and all sources of excitement carefully avoided. If the attack is very rebellious, a large blister should be applied to the lower part of the spine.

PARALYSIS.

Paralysis of the bladder may arise from various causes, some of which are seated in the organ itself, others in the cerebro-spinal axis, and others, apparently, in the mind. Thus, the organ is often palsied by external injury, as a blow or kick upon the hypogastrium, or the pressure of the child's head in parturition; inflammation of its different tunics; or over-distension of its muscular fibres from protracted retention of urine. Compression of the brain and spinal cord is always followed by loss of power of this organ. Want of tone in the general system may induce the disease, as is so often witnessed during the progress of encephalitis, apoplexy, and fever, especially typhoid. The bladder first loses its sensibility, in consequence of which the urine ceases to make its accustomed impression, and continues to accumulate, without awakening any desire to evacuate it, until the muscular fibres become so much stretched that they are incapable of fulfilling their office.

Severe injuries, amputations, the ligation of hemorrhoidal tumors, and various other operations, are liable to be followed by transient paralysis of this organ. Lying-in females are often unable to pass urine for several days after delivery.

There is a form of paralysis of this organ to which the term *senile* may be applied. It is most common in elderly, indolent men, who have indulged freely in the pleasures of the table, and who have habitually neglected the calls of nature. The paralysis usually comes on in a slow, stealthy manner. One of the first symptoms which attract attention is a slight difficulty in starting the urine. As the disease advances, the muscular contractility is still further impaired; and the water, instead of being ejected in a bold, full stream, falls between the patient's legs or upon his shoes.

As soon as the bladder has lost its power of contraction, its contents accumulate and distend its walls. The organ gradually rises above the pubes, forming a tumor which sometimes reaches as high as the umbilicus, and as far outwards as the brim of the pelvis. The swelling is of an ovoidal shape, fluctuating, indolent at first, but painful afterwards, and attended with complete retention, which constitutes one of the characteristic symptoms of the disease. The duration of the paralysis varies from a few hours to several weeks, months, or even years. Occasionally it ceases only with life. When the paralysis is produced by injury of the spinal cord, the urine is usually highly alkaline, very dark or turbid, of an ammoniacal odor, and surcharged with thick, ropy mucus. Phosphatic matter soon makes its appearance, and the lining membrane speedily becomes inflamed, if not ulcerated, followed by a discharge of blood and pus. Persons thus affected are very prone to calculous diseases.

The *prognosis* of vesical paralysis will depend upon the nature of its causes, the character of the treatment, and the age of the patient. If the bladder has been very greatly and protractedly distended, it will necessarily be a long time in recovering its former vigor, if, indeed, it ever does.

The *treatment* of an affection depending upon so many and such opposite causes must necessarily be of a very diversified character. The urine, as a general rule, should be drawn off at least three times a day. Occasionally the catheter may be constantly retained, especially when there are pain and spasm of the neck of the bladder, with a frequent desire to pass water. When the accumulation is very great, and has continued for several days, the best plan is not to evacuate all the fluid at once. The use of the instrument should be discontinued as soon as the organ has regained its expulsive power.

Another important indication is to impart tone to the bladder. For this purpose, various remedies may be used. A brisk *cathartic*, consisting of calomel and jalap, will often produce the most prompt and happy effect, and should be one of the first remedies that are administered after the organ has been relieved of its burden. The medicine may be repeated, in small doses, at first every other day, and afterwards twice a week.

Emetics are sometimes of signal benefit. They are particularly valuable when the paralysis is coincident with disorder of the digestive organs, and torpor of the general system. They are contra-indicated in the traumatic form of the disease.

After the bowels have been well evacuated, and the secretions restored, recourse may be had to remedies calculated to make a more direct impression upon the nervous system. At the head of this class of agents may be placed *strychnia*, cantharides, and arnica. An excellent formula, when they are given in combination, is the twenty-fourth of a grain of strychnia, half that quantity of cantharides, and from three to five grains of extract of arnica, three times in the twenty-four hours, care being taken to watch the effect. If spasmodic twitchings, strangury, or gastric irritability ensue, it may be assumed that they have been carried far enough, or that some modification should be made. In paralysis of the bladder, consequent upon typhoid and other fevers, masturbation, and general exhaustion, few remedies are so serviceable as arnica.

Strong testimony has repeatedly been published in favor of the *ergot* of rye in the treatment of this affection. The dose usually given, in the twenty-four hours, is from one to two scruples of the recent powder. The best form of administration, perhaps, is a very strong tincture, prepared with six ounces of the substance to a pint of spirit, the dose being a drachm three times a day, in an effervescing draught of citrate of ammonia. The fluid extract is also a convenient method of administration.

In the inflammatory form of the disease, characterized by pain and spasm of the neck of the bladder, with a constant desire to urinate, and more or less febrile commotion, the treatment should be conducted upon strictly antiphlogistic principles.

When the disease is associated with general debility, tonics are indicated. Ordinarily, a preference is given to the chalybeate preparations, combined, if necessary, with quinine, strychnia, cantharides, arnica, and other articles.

In *hysterical* paralysis, the mind is affected rather than the bladder. The want of power is, no doubt, sometimes real, but oftener it is feigned. Some are always promptly relieved by assafœtida, valerian and morphia, aided [illegible] catheter. These remedies, however, are merely palliative, not radical. To a permanent cure, the treatment should be directed to the improvement [illegible] mind and of the general health rather than of the condition of the bladder.

Counter-irritation is a useful auxiliary to the other remedies. A succession of blisters over the dorso-lumbar region often proves highly beneficial, by stimulating the spinal cord. The vesicated surface may be sprinkled every [illegible] hours, over a space of about the size of a dollar, with the fourth of a grain [illegible] strychnia.

I am not partial to pustulations with tartar emetic ointment, but this [illegible] counter-irritation is occasionally advantageous. With the moxa, in the treatment of this affection, I have no experience.

The actual cautery is a most powerful and suitable agent, especially in more rebellious forms of vesical paralysis. The best place for applying [illegible] about the junction of the last lumbar vertebra with the sacrum; in traumatic cases, however, depending upon injury of the spine, it ought sometimes [illegible] used much higher up. The instrument employed for this object should be one inch in diameter; and a free discharge should, if necessary, be maintained for several months.

Counter-irritation by seton is hardly to be recommended in any case. Frictions over the perineum and hypogastrium with stimulating embrocations, [illegible] as turpentine and ammonia, are sometimes serviceable.

Another remedy of great potency, in many cases of this disease, is the *douche*. It is a most powerful stimulant, and sometimes rouses the dormant energies of the bladder when almost everything else has failed.

Finally, *galvanism*, as a local stimulant, should not be neglected. It is particularly indicated in senile palsy, attended with a partial failure of the [illegible] of the lower half of the body.

No very satisfactory observations have yet been made in regard to direct medication in the treatment of vesical paralysis. Paul of Ægina and some [illegible] practitioners have advised astringent injections; and Deschamps states that [illegible] had cured several persons with cold water thus employed. In a very obstinate case, which resisted every known method of treatment, both general and local, [illegible] ten weeks, a cure was speedily effected by injections of strychnia. The proper dose of the article, when thus administered, is from one-sixth to one-fourth [illegible] grain, dissolved in two ounces of tepid water, and repeated every twenty-[illegible] hours.

RETENTION OF URINE.

The symptoms of retention of urine are generally well marked, even at an early stage of the complaint. In this respect, however, there is, as might be supposed, considerable diversity in different cases, depending mainly upon the natural tolerance of the bladder, and the character of the exciting cause of the disease. In paralysis of the muscular fibres of the organ, attended with loss of sensation, the accumulation may make great progress, and yet the individual not be aware of his real condition. A slight discharge of urine, perhaps, occasionally takes place; or if, as often happens, incontinence is soon superadded *to the original* disorder, the fluid dribbles off incessantly, and thus both patient and physician are lulled into a false security. When, on the contrary, the retention is inflammatory, more or less pain, and frequent inclination to void the urine, with inability to do so, attend the complaint, and at once expose its true nature.

The characteristic *symptoms* of this affection are, the existence *of a hard*, pyriform, circumscribed tumor, corresponding with the middle line, more or less tender on pressure, fluctuating, not affected by change of posture, and *gradually increasing* in volume; a frequent desire to void the urine, which, if passed at all is discharged in drops, or small jets, never in a full stream, or in any considerable quantity; uneasiness and a sense of weight in the pelvic region, soon followed by pain and spasm; straining, forcing, or tenesmus at every attempt at micturtion; at first absence of fever, and then rigors, alternating with flushes of heat, and, in the latter stages of the complaint, excessive restlessness, an indescribable sense of oppression, urinous breath and perspiration, typhomania, and a Hippocratic condition of the countenance. In addition to these signs, which none but a heedless practitioner can mistake, there is also generally, after the first few days, a constant dribbling of urine, and the distended bladder may easily be felt by the finger introduced into the rectum or the vagina.

In ascites, with which this affection is most liable to be confounded, the abdominal tumor is diffused, not circumscribed, and changes its form and situation with the position of the body; there is little, if any, tenderness on pressure and percussion; the sense of fluctuation is more distinct; the progress of the disease is more tardy; the urine, although more scanty than in health, is voided several times in the twenty-four hours, generally without pain or difficulty; there is commonly anasarca of the lower extremities; the skin is remarkably dry and harsh; and there is usually an absence of febrile disturbance and always of typhomania and of urinous perspiration.

The *treatment* of retention of urine is, in the first instance, by the catheter; for the indication is to relieve the distended organ without delay, before the part and system have sustained serious mischief. When there is great accumulation, amounting to several quarts, it will be most safe, as a general rule, not to empty the bladder completely at a single operation, but gradually. The catheter is introduced, and half the fluid is evacuated, to afford the overstretched fibres an opportunity of contracting and regaining their power. Some hours afterwards the instrument is again used, and then the remainder of the urine is withdrawn. When this precaution is neglected, or unavoidable, the abdomen should be supported by a compress and a broad roller. A large opiate should be given just before or immediately after the operation, if not contra-indicated by cerebral oppression.

Retention of urine may be produced, 1st, by mechanical obstruction; 2dly, by paralysis; 3dly, by spasm; 4thly, by inflammation; 5thly, by gout and rheumatism; 6thly, by the presence of some pelvic tumor; and 7thly, by the effects of miasm.

1st. The first class of causes may affect either the urethra, the bladder, or the head of the penis.

a. The *urethra* may be obstructed by an organic stricture, a calculus, a small tumor, clotted blood, plastic matter, or inspissated mucus. A catheter, bougie, or other foreign body may break off in the canal, and thus become an impediment to the egress of the urine.

In organic stricture, the ordinary means are resorted to; when these fail, the only resource is puncture of the bladder.

An impacted calculus may, in general, be pushed back into the bladder, or extracted with the urethra-forceps. When these means are unsuccessful, it is removed by incision. Pieces of bougie and other foreign bodies are managed on the same principle. Clotted blood, lymph, and inspissated mucus, are easily displaced by the catheter, or forced out by the urine. When the sides of the urethra are glued together by adhesive matter, the obstacle can only be overcome by the gentle use of the instrument.

The retention is sometimes occasioned by congenital occlusion of the urethra, of which there are several varieties. However induced, or in whatever form it may present itself, the obstruction is almost always easily overcome by the knife, aided with the catheter; or, when the occlusion is owing to simple narrowing of the canal, a cure may be effected by the steady and judicious use of the bougie. Retention in the female is occasionally caused by maldirection of the urethra.

The obstacle may lie exterior to the urethra, as an abscess in the perineum, or a deep-seated collection of blood, an effusion of lymph, or the presence of a malignant tumor. Cancer of the penis and contusions of the perineum are frequently followed by the worst forms of retention of urine.

When the obstacle is seated externally, and bulges inwards, so as to occlude the canal, the knife supersedes the catheter. Extravasated blood is to be treated by sorbefacients, as the application of acetate of lead, hydrochlorate of ammonia, or spirituous embrocations. In contusions of the perineum, with the catheter is used; but when the accident is attended by lacera incision is made, to save the tissues from urinary infiltration.

b. In the second place, the obstruction may be seated in the *bladder.* class of causes, the most frequent are hypertrophy of the prostate gland lated blood, inspissated mucus, lymph, and urinary concretions. The uterus, or any other pelvic tumor, may, by compressing the neck of the give rise to a similar effect.

The most common form of obstruction of the bladder, productive of of urine, is hypertrophy of the *prostate gland.* The enlargement may the entire organ, or it may be limited to one of its lateral lobes, or even mammillary process. The obstacle thus occasioned is usually temporary, is liable to be re-excited by the slightest exposure to cold, irregularity horseback exercise, sexual indulgence, or neglect to empty the bladder.

The *treatment* is by the catheter; and one of silver is far preferable to gum-elastic. It must not be too abrupt in the curve, and should be at least inches and a half in length, otherwise it may fail to reach the distended voir. When the instrument comes in contact with the enlarged gland, the geon introduces the left index-finger, well oiled, into the rectum, and plac against the beak, he guides it into the bladder, by pushing it gently towards side, or upwards towards the pubes, at the same time that he urges the on with the right hand. In order to empty the bladder entirely, it is nec as the point of the catheter cannot reach the cavity behind the *gland,* to the patient's hips, or to turn him on his belly, so as to force the urine out hiding place. In very old men, with inordinate enlargement of the pros its longitudinal direction, the silver catheter may generally be advantag replaced by a gum-elastic instrument, at least from twelve to fifteen inches and introduced upon a stylet with a pretty sharp curve, so as to enable the to pass under the arch of the pubes.

Retention of urine from *coagulated blood* in the bladder is a very serious When the quantity is very large, relief must be sought by an opening perineum, similar to that in lithotomy. Ordinarily, however, evacuation be attempted with a full-sized silver catheter, with four large eyelets, injections of warm water, and an exhausting syringe. Sometimes the may be accomplished with a large silver catheter, the orifice of which pletely occluded with an obturator attached to the vesical extremity of a removed the moment the instrument reaches the bladder. The usual means are also employed. When the blood has been recently *effused,* to wait from six to ten hours, until the fluid has subsided to the bottom of bladder, when the supernatant urine may generally be withdrawn with culty.

Retention caused by inspissated *mucus,* plastic matter, worms, or calc concretions, is, in general, easily relieved by the catheter. When it dep upon the pressure of the gravid uterus, it can only be remedied by re the position of the displaced organ.

Retention of urine is sometimes produced by pressure of the rectum upon neck of the bladder. Anything having a tendency to cause inordinate disten of the bowel may give rise to such a condition.

c. The obstruction may be occasioned by an *imperforate prepuce.* Wh this is the case, relief is sought by a free incision. In the female, *it is* somet caused by a fleshy excrescence in the orifice of the tube, and then excision is course, the proper remedy.

d. Retention may depend upon *priapism,* induced by inflammation of penis, by excessive cerebral irritation, as in lesion of the brain, or by the im nate use of cantharides. However this may be, recourse is at *once* had to catheter, attention being afterwards paid to the removal of the exciting cause.

2d. The bladder may be unable to expel its contents in consequence *of par ysis* of its muscular fibres. The most common causes of this condition ar apoplexy, injury of the spine, over-distension of the organ, and the effects of fever, contusions, lacerated wounds, and capital operations. The use of anodynes, in large doses, will sometimes induce temporary paralysis of the bladder.

In low forms of fever, especially when delirium is present, in compound fractures and dislocations, in lacerated wounds, in contusions of the abdomon, and in strangulated hernia, frequent inquiry should be made into the condition of the bladder, in order to guard against retention, or to relieve it speedily, if it is found to be unavoidable. The liability of this variety of retention to be followed by incontinence cannot be too forcibly or too frequently impressed upon the mind of the reader. It is to this form of the affection that I have applied, in my Treatise on the Urinary Organs, the term *incontinence of retention*, in the hope that, by an antithetical expression, I might attract particular attention to it.

Retention from paralysis is relieved by the catheter, and it is better to introduce the instrument frequently than to permit it to remain. When the return of contractility is slow and imperfect, our chief reliance must be upon gentle but steady purgation, the internal use of strychnia, cantharides, and tincture of the chloride of iron, the cold shower-bath, vesication of the sacro-lumbar region, and irritating frictions to the spine. When the loss of power is dependent upon the use of anodynes, cold applications to the head, the hypogastrium, perineum, and genitals will usually suffice to afford relief.

Retention of urine from paralysis of the bladder, whether induced by traumatic or internal causes, often ceases very suddenly of its own accord, or under the use of mild remedies.

Under this head may be noticed a variety of retention of urine which is occasionally met with in *hysterical* females, and which seems to be dependent rather upon a deficiency of volition than upon paralysis of the muscular fibres of the bladder. The affection is, in general, temporary, but may last for days or weeks. In a case recently under my care, it had persistently continued for upwards of three years, during the whole of which the urine was drawn off regularly twice every twenty-four hours. Purgatives, assafœtida clysters, and the internal use of antispasmodics and chalybeate tonics, either alone or in union with cantharides, are the remedies mainly to be relied upon. Cold water, poured upon the sacro-lumbar region in a continuous stream, from a height of three or four feet, often affords speedy relief. The catheter must, if possible, be avoided. Moral treatment is often the most successful. Too much kindness will only tend to prolong the case.

3d. Retention of urine from *spasm* of the neck of the bladder, or of this organ and ot the urethra, is commonly produced by cold, suppression of the cutaneous perspiration, the irritation of ascarides, hemorrhoidal tumors, stone in the bladder, disorder of the digestive apparatus, the use of fermented, vinous, or alcoholic drinks, and the effects of cantharides. The warm bath, hot fomentations, and the inhalation of chloroform, followed by the free use of camphor and morphia, or morphia alone, either by the mouth or rectum, generally afford prompt relief. Cold applications sometimes answer better than warm. When the symptoms are urgent, recourse is had to the catheter.

In retention, from the absorption of cantharides, known as strangury, the most effectual remedies are anodyne injections, hot fomentations, and the exhibition of liquor potassæ in half drachm doses every hour, along with the liberal use of demulcent fluids.

4th. The retention of urine may be produced by *inflammation* of the urethra and the neck of the bladder. The symptoms are a frequent desire to urinate, with an inability to pass more than a few drops of water at a time; a sense of smarting, burning, or scalding in the urethra and the head of the penis; violent straining; a feeling of weight about the anus; and throbbing in the perineum. Occasionally, the urine is mixed with blood and pus.

The *treatment* is, of course, antiphlogistic. Spasm is allayed by anodyne enemata and mucilaginous drinks. General and local bloodletting may be necessary. The warm bath is highly useful. The bowels are moved by mild laxatives. When the symptoms are urgent, and the means here indicated are ineffectual, the catheter must be introduced. In inflammatory retention, accompanied by spasm of the bladder and urethra, prompt and decided relief is occasionally obtained from the inhalation of chloroform.

5th. The disease is sometimes caused by *gout and rheumatism*, especially [illegible] elderly, broken-down individuals that have long been addicted to the pleasures of the table, and to inordinate sexual indulgence. The attack is either [illegible]dent with gout and rheumatism in other structures, or it shows itself as a precedent affection. In either event, the most suitable remedies are Dover's powder, colchicum and morphia, purgatives, alkalies, and the hot bath.

6th. The retention may depend upon the pressure of a *pelvic abscess*, or *pelvic tumor*, as a serous, bloody, or hydatic cyst, developed between the bladder and the rectum. Inordinate distension of the bowel by hardened feces and displacement of the uterus, especially retroversion of the organ, may also produce it. Retention occasionally takes place during utero-gestation and parturition. The treatment of such cases is sufficiently obvious.

Finally, there is a *periodical* form of the disease which comes on at a regular time, very much like an attack of intermittent fever, and evidently dependent upon similar causes. It is met with chiefly, if not exclusively, in malarious regions. The treatment must, of course, be by quinine, either alone, or in [illegible] with arsenic and other antiperiodic remedies.

CATHETERISM.

The introduction of the catheter, although apparently very simple, is one of the nicest and most delicate operations in surgery. It requires skill of the highest order, as well as the most intimate knowledge of the anatomy of the urinary organs. My conviction is that few men perform it well.

Catheters are cylindrical tubes, of variable composition, size, and shape. The best are made of silver, and are, for an adult, about nine inches and a half long, by two lines and a half in diameter; they are perfectly smooth, light, and bent for one-third of their length, to accommodate them to the natural curvature of the urethra. The vesical extremity, which is rounded off, but closed at the point, and nearly of the same thickness as the rest of the instrument, has an oval opening on each side, as exhibited in fig. 455, a quarter of an inch long, and about a line in width, for the entrance of the urine. Instead of this arrangement, this part of the tube is sometimes pierced with numerous little apertures, as in fig. 456, but these are objectionable because of their liability to become clogged with blood and mucus. For the removal of urine, mixed with these substances, I have had a catheter constructed with eight eyelets. A catheter with the opening at the extremity, and provided with a closely-fitting conical stopper, secured to a stylet, is also well adapted to this object, as the orifice remains

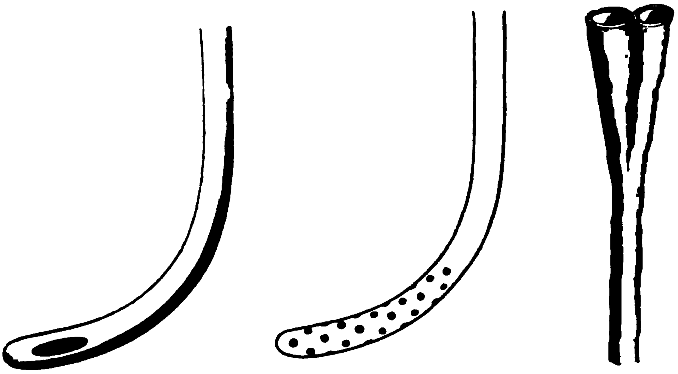


Fig. 455. Fig. 456. Fig. 457.

Different forms of catheters.

closed until the tube is fully in the bladder.. The other extremity, usually called the handle of the instrument, is open, and is provided on each side with a small ring, for securing it in its place when it is necessary to retain it in the bladder. The French pocket catheter consists of two pieces, united by a screw, and is adapted for either sex. The gum-elastic instrument, so much lauded by some practitioners, I never employ, except in inordinate enlargement of the prostate gland, as it is extremely liable to bend whenever it meets with the slightest resistance, and is also very easily injured by the urine. Every practitioner should have an assortment of catheters of different dimensions, that he may be prepared for any emergencies that may arise. For washing out the bladder, for the removal of blood and mucus, or for introducing fluids, a double catheter, represented in fig. 457, is necessary. When the object is to throw up medicated fluids, as nitric acid and water, a silver instrument is required.

When the urethra is entirely sound, a tolerably large catheter, one that will gently distend the parietes of the tube, is selected. An instrument of this size is not so likely to be arrested by the folds and follicles of the mucous membrane, or to impinge against the margins of the opening in the triangular ligament. Previously to inserting it, it should be well warmed and oiled.

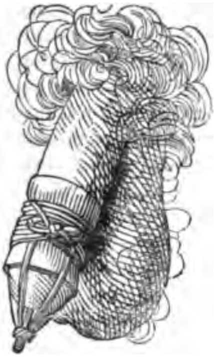
The catheter may be introduced while the patient is standing, sitting, or lying; but, whatever posture may be selected, it is important that the thighs should be moderately separated from each other, and flexed upon the pelvis, to relax the abdominal muscles. In the first case, the patient leans with his back against the wall, and inclines his chest slightly forwards, so that he may not change his position during the operation. The surgeon may take his place either at the front or side. If he sit, the breech should project over the chair, and the body directed backwards. The position of the operator is the same as before. The most convenient posture, however, is the recumbent. The patient lies on his back, near the edge of the bed, the head being supported by a pillow, and the knees, slightly separated from each other, somewhat raised. The surgeon, standing at the left side of the bed, takes the penis in the left hand, and raises it to a right angle with the body to efface the curve which it forms at the pubes. The catheter, held in the right hand, between the thumb and first two fingers, is inserted into the orifice of the urethra, its concavity being directed towards the pubes, while the handle is nearly in contact with the median line of the abdomen. The instrument is now passed on, until its beak reaches the sinus of the bulb, which lies upon the anterior surface of the triangular ligament, rather deep in the perineum. To disengage it from the sinus, the handle is changed from the horizontal direction, in which it has hitherto been held, into the vertical, at the same time that the point is slightly retracted. By this manœuvre, the curved portion is brought under the arch of the pubes, and immediately opposite the opening in the triangular ligament. By now depressing the handle of the instrument on a level with the thighs, or, rather, a little between them, its point will readily glide over the prostatic part of the urethra into the bladder.

In performing this operation, no force is employed; on the contrary, the whole proceeding is conducted with the utmost gentleness. The catheter, held as lightly as possible, is made to glide along, as it were, by its own weight, and by that of the hand. The penis should be drawn slightly forward over the instrument, just sufficiently to render the urethra a little tense. Everything like stretching and pulling should be avoided.

In introducing the straight catheter, the patient lies on his back, and the surgeon stands on the right side of the bed, instead of on the left, as in the other case. The penis is held in the left hand, at a right angle with the body, and the instrument is carried down perpendicularly as far as the sinus of the bulb. To free it from this depression, the point is retracted a few lines, and then, while the penis is lowered between the thighs, it is at once pushed onward into the bladder.

Various contrivances are used for retaining the catheter in the bladder. The one which I usually prefer consists of a broad waistband, with two thigh-pieces fastened in front and behind, so as not to interfere with the anus and the

Fig. 458.



Mode of securing the catheter in the bladder.

scrotum. The instrument, having been introduced, is secured by two strips of linen, tape, or oiled silk, by tying the middle of each to the ring of the catheter, and the ends to the vertical bands. Another very good plan is to surround the penis with an ivory, elastic, or linen yoke, and to secure this against the pubes by means of four pieces of tape, carried round the thighs and pelvis. The catheter is then fastened to the ring or yoke in the usual manner. In the annexed drawing, fig. 458, the instrument is secured to a piece of linen, passed round the penis, just behind its head. The contrivance, however, is objectionable, on account of its liability to injure the penis, in case of erection, and to slip when the organ is flaccid.

To prevent undue pressure upon the mucous membrane of the bladder, the catheter, if intended to be retained, should be at least two inches shorter than one used for merely drawing off the urine.

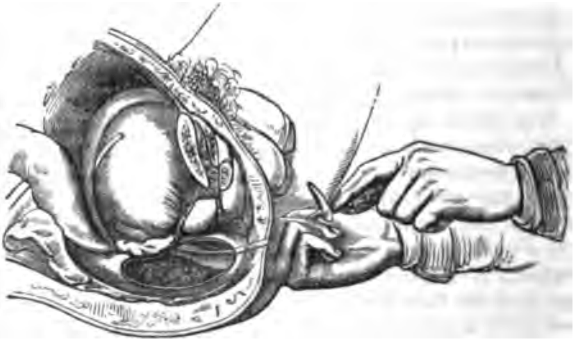
PUNCTURE OF THE BLADDER.

When the catheter, bougie, and other means have failed to procure relief, the only thing that remains is to puncture the bladder. Fortunately, this operation is seldom necessary. It is only in cases of excessive enlargement of the prostate gland, attended with great tenderness and swelling of the surrounding parts, in laceration of the urethra, infiltration of urine into the scrotum, and in deep-seated, impassable stricture, that the operation should ever be seriously thought of. I have myself been obliged to perform it only twice, and then the cases were not my own.

There are four routes by which the organ may be approached when this operation becomes necessary, the rectum, perineum, hypogastrium, and pubic symphysis. Of these, the first is the one usually preferred, on account of the facility of performing the operation, and its supposed freedom from the danger of urinary infiltration. It is, of course contra-indicated when there is great enlargement of the prostate gland, or serious disease of the anus, rectum, or bas-fond of the bladder. The operation is occasionally followed by peritonits; and several cases have been reported in which it gave rise to emphysema, extending to the upper parts of the body.

a. The *rectal puncture* is executed with a curved trocar, about four inches in length, and provided with a suitable canula. The breech of the patient is brought over the edge of the bed, and his legs are supported by two assistants, as in the

Fig. 459.



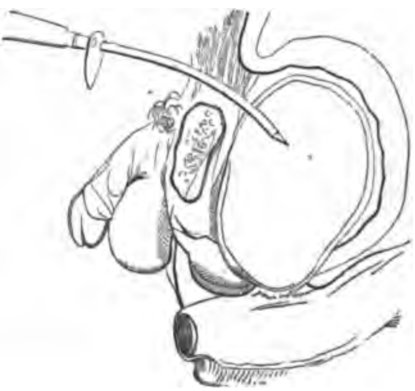
Rectal puncture of the bladder.

operation for stone. The surgeon, oiling the index and middle fingers of the left hand, introduces them into the bowel, in contact with its anterior wall; he then takes the instrument in the right hand, and retracting the point of the trocar within its sheath, places it in the groove formed by the junction of the two fingers. When the instrument has passed the posterior margin of the prostate gland, the handle is depressed, and the point urged on through the superimposed structures into the interior of the bladder, as shown in fig. 459. The want of resistance, and a slight escape of urine, will indicate that the instrument has reached its destination. By a sort of double movement, the trocar is now withdrawn, and the canula pushed farther on into the distended viscus. The urine being evacuated, the canula is either at once removed, or, if there is any serious obstacle along the natural passage, it is retained until this is surmounted.

b. The *perineal puncture* is to be preferred, when the retention is caused by an impassable stricture or by injury of the urethra, perineum, or neck of the bladder, followed by infiltration of urine. The patient being placed and held, as in the other operation, a moderate-sized catheter is carried down to the seat of the obstruction, where it is firmly supported by an assistant, and its point exposed by direct incision, in the raphé of the perineum. The knife is next conveyed backwards, through the constricted part, and thence, by successive touches, through the posterior portion of the urethra as far as the neck of the bladder. As soon as the organ is reached, the urine rushes out in a full stream. A catheter is then passed and retained in the usual manner. Care is taken not to wound the rectum and the arteries of the bulb.

c. The *supra-pubic puncture* has generally been regarded as more objectionable than any other, because of the great danger of the escape of urine into the peritoneal cavity and the surrounding cellular substance. In performing the operation, the patient is placed on his back, the skin is divested of hair, and an incision is made from below upwards, along the median line, from an inch to an inch and a half in length, according to the condition of the parts, first through the common integuments, and then through the fibrous structure between the pyramidal muscles, down to the cellular tissue which covers the distended organ. Through this opening the bladder is pierced at its lowest part, by means of a long curved trocar, seen in fig. 460, the point of the instrument being inclined obliquely downwards and backwards in the direction of the promontory of the sacrum. Transfixion being completed, the trocar is withdrawn, and the canula gently passed into the bladder, where it is retained by an appropriate bandage, until the obstruction necessitating the operation has been removed. The patient, in the mean time, lies on his side, to promote the escape of the urine.

Fig. 460.



Supra-pubic puncture of the bladder.

d. The *inter-pubic puncture* of the bladder is of modern invention; and, although it has been performed successfully by several surgeons, among others, by Dr. Leasure, of Pennsylvania, it would, perhaps, be premature to express any opinion respecting its relative and absolute merits. As the name implies, the instrument is passed through the centre of the pubic symphysis, and, consequently, only a short distance from the urethra. It has the advantage of facility of evacuation, and of freedom from infiltration.

INCONTINENCE OF URINE.

Incontinence of urine, the reverse of retention, with which it is [illegible] ciated, may occur at any period of life, and may be partial or [illegible] or permanent. It may be excited by a great variety of [illegible] prominent of which, however, are referable to external injury, [illegible] spasm, paralysis, or morbid sensibility of the bladder, or of [illegible] the urethra. The water may pass off as fast as it is [illegible] retained for a time, and then either dribble away, or be [illegible] stream.

a. The best example of incontinence from *external* [illegible] tomy. A kick, blow, or fall upon the perineum is occasionally [illegible] similar result. Incontinence from this cause often [illegible] and, on the other hand, it is occasionally incurable. The treatment [illegible] ducted upon general principles.

b. Incontinence from *inflammation* may depend upon various [illegible] The escape is usually partial, and is almost constantly [illegible] pain and spasm. The treatment consists in removing the [illegible] in employing the lancet, the hip-bath, antispasmodics, and [illegible] The catheter often affords instant relief.

c. The disease is occasionally induced by *gout and rheumatism* [illegible] generally coming on as a secondary affection, being translated [illegible] originally affected to the bladder, the mucous and muscular [illegible] rendered exquisitely sensitive, with a constant inclination to [illegible] urine is usually surcharged with lithates, and there is always [illegible] the digestive apparatus. Relief is afforded by thorough [illegible] regulation of the diet, and the exhibition of colchicum and [illegible] powder, and the alkalies. If the patient is very plethoric, blood [illegible] from the arm; if anemic, recourse must be had to tonics and [illegible]

d. Paralysis of the bladder, or of this viscus and of the [illegible] induced, is a frequent cause of incontinence. It is particularly [illegible] vene upon injury of the brain and spinal cord. It also [illegible] turition. Owing to the fact that the sphincter muscle [illegible] contractile power, more or less of the urine is apt to accumulate in [illegible] while the rest gradually passes off, leading thus to a belief on the [illegible] practitioner that the case is one purely of incontinence, when, in [illegible] both of incontinence and retention.

In the treatment of this affection, our remedies must be addressed [illegible] the invigoration of the nervous system. For this purpose, after having [illegible] out the bowels and corrected the secretions, the patient is put on [illegible] strychnia, either alone or combined with some mild tonic, such as the [illegible] gentian and sulphate of iron. Cantharides may also be advantageously [illegible] especially if carried to the extent of slight strangury. The diet should [illegible] and the patient should make frequent use of the cold shower-bath, [illegible] dry frictions. Counter-irritation by blisters is kept up in the [illegible] region. Occasionally prompt relief is afforded by injecting the bladder [illegible] with from one-sixth to one-fourth of a grain of strychnia.

e. Incontinence may arise from a *morbid sensibility* of the neck of the [illegible] der, or of the entire organ, excited by the acid character of the [illegible] sympathy with the kidney, rectum, anus, vagina, or uterus. Masturbation, [illegible] inordinate sexual indulgence, may be followed by a similar result. In [illegible] these instances, the incontinence is incomplete.

To this variety of the affection obviously belongs that form of the [illegible] known as *puerile incontinence.* It is most frequent in young [illegible] before the age of ten, and often begins very early in life. The discharge [illegible] may take place several times during the night, is most common towards [illegible] and is occasionally effected under the influence of the will or of a dream [illegible] general, it is strictly involuntary. When it becomes habitual, as it usually [illegible] it may last for years. In most cases, however, it gradually disappears [illegible] approach of adolescence. It is promoted by the use of fluids, by exposure to cold, and by sleeping on the back, a posture favorable to the accumulation of urine in the morbidly sensitive portion of the bladder.

In boys one of the most common exciting causes of this affection is masturbation, and this unnatural habit, if indulged in, will frequently keep up the incontinence until a late period of life. In young children it is often produced by ill health, arising from improper feeding and want of good air and exercise, followed by disorder of the digestive organs; by malarious diseases; by worms in the alimentary canal; by the inordinate use of saccharine drinks; and by the irritating properties or the excessive quantity of the urine.

In the *treatment* of this form of incontinence, particular inquiry should be made into the nature of the exciting cause, the removal of which is of paramount importance. In that variety of the affection which is met with in boys and girls, the cure may be greatly expedited by proper attention to the diet, which should always be bland and unirritating. Late suppers are avoided, and the patient must abstain entirely from drinks for several hours before going to bed. During the night, he is to be thoroughly waked two or three times for the purpose of emptying his bladder, and this practice is to be persisted in for weeks and even months, until the disagreeable habit is broken up. During all this time, as well as, indeed, for a long period afterwards, the child should lie upon his side, to prevent the urine from coming in contact with and irritating the neck of the bladder. The internal remedies, from which I have derived most benefit in the treatment of this affection, are strychnia and cantharides, given three times a day, in the proportion of the twentieth or thirtieth of a grain of the former to the twentieth of a grain of the latter, according to the age of the subject. A minute portion of morphia forms a valuable addition; and, in atonic cases, I often combine with these articles some of the preparations of iron. When the strychnia disagrees, or fails to answer the purpose, we may substitute the extract of nux vomica. In either event, it is important to watch the effects of the remedy. I have great confidence in the use of cantharides in this affection, having known them to afford relief when everything else seemed to prove unavailing. I prefer the powder to the tincture, and occasionally continue the exhibition until slight strangury is induced. Benzoic acid has also been highly recommended, but the trials I have made of it have disappointed my expectations. When the morbid sensibility of the bladder is connected with inflammation, the balsam of copaiba, in doses of from ten to fifteen drops every eight hours, is sometimes beneficial. In this variety of the affection a full anodyne at night, especially in the form of Dover's powder, often exerts a happy effect in controlling the discharge.

Many practitioners have great confidence in the efficacy of belladonna in the treatment of nocturnal incontinence of urine, some regarding it almost as a specific. That the remedy is a valuable one, is certain, but the results of my experience are altogether opposed to such a sweeping conclusion. It should be administered in small doses, as the fifteenth or twentieth of a grain of the extract, dissolved in distilled water and syrup of ginger, three times in the twenty-four hours, with an occasional intermission for a few days, especially if it causes confusion of sight or redness of the skin. A steady perseverence in the medicine, for several months, will generally be necessary to insure a cure, although in most instances its good effects become almost at once apparent. I have met with several obstinate cases of nocturnal incontinence in boys in which a permanent cure was effected by the daily use of the subcutaneous injection of ten drops of the tincture of belladonna.

The cold shower-bath should be used twice a day, or cold water poured from a considerable height upon the lower portion of the spine, and blisters applied to the sacro-lumbar region, the perineum and thighs. In obstinate cases, the neck of the bladder is cauterized, as in spermatorrhœa, but much more mildly. In the female the application is made to the orifice of the urethra, and a similar expedient sometimes answers a good purpose in boys, the urine, as it comes in contact with the tender surface, waking them up, so as to induce them to rise and empty the bladder.

The application of pressure to the urethra, gentle but steady, and gradually increased, has sometimes been found beneficial in removing the complaint.

In nocturnal incontinence, one of the chief duties of the practitioner is to secure the co-operation of the patient. The child must be reasoned with, and even threatened with chastisement; of course, he is not beaten, nor does any sensible man ever think, at the present day, of tying up the penis.

Some interesting facts in relation to nocturnal incontinence of urine, as it occurred, in 1857, in the Philadelphia House of Refuge, were published a few years ago by Dr. Addinell Hewson, one of the surgeons. Of 292 boys, not less than 78 were simultaneously affected with the disease. Of the 78, however, only 63 were under observation all the while, and of these 34 were negroes. The ages ranged from seven to eighteen years, the average being thirteen. Many of the boys bore the marks of ill health, especially of disorder of the digestive organs: 24 suffered from ascarides; some had herpes; 20 labored under constipation; and nearly all were suspected of masturbation, eighteen acknowledging their guilt. The prepuce was discolored and elongated, either from frequent scratching or pulling, in not less than 46 cases. A considerable number wet themselves both day and night. The urine deposited uric acid in nearly one-half of the cases. The use of stimulating food, and sudden atmospheric changes, always produced a marked increase of the disorder. The remedies which proved most efficacious were the juice of belladonna, prepared according to Bentley's process, magnesia, the cold douche, and a reduced supper of bread, without any drink. Those who had worms were treated with turpentine and bicarbonate of soda. Each boy was compelled to get up and micturate an hour after retiring at night. Under this treatment, especially the influence of a restricted diet, enjoined as a punishment, the endemic rapidly disappeared.

Finally, when the incontinence is irremediable, the patient should wear a *urinal*, to prevent the fluid from soiling his clothes. The best contrivance for this purpose is a gum-elastic bottle, shaped somewhat like a Florence flask, and capable of holding about twelve ounces. The subjoined cuts will convey a better idea of the apparatus than any description. Fig. 461 represents the male, fig. 462 the female, urinal. Each instrument is furnished at its inferior extremity with a screw, for the purpose of evacuating the urine after it has accumulated to some extent in the artificial reservoir. The interior should be frequently washed

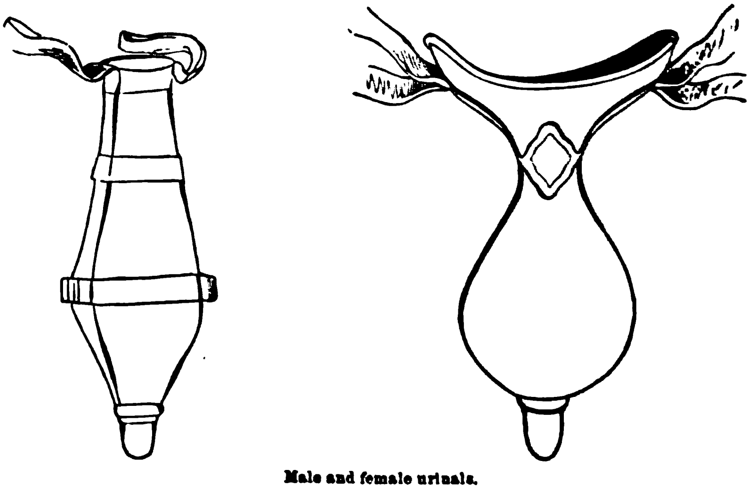


Fig. 461. Fig. 462.

Male and female urinals.

for the sake of cleanliness, and every patient should be provided with an extra vessel, so that he may not suffer any inconvenience in case of accident.

HEMORRHAGE.

A discharge of blood from the bladder, technically denominated hematuria, although not of frequent occurrence, is generally a source of disquietude to the patient, from a belief, not altogether unfounded, that it is a symptom of evil import. The bleeding occurs in both sexes, and at all periods of life. Men, however, are more prone to it than women; and it is likewise more common in old and middle-aged subjects than in children and adolescents.

Vesical hemorrhage presents itself under two varieties of form, the idiopathic and the traumatic. The idiopathic variety is infrequent, and is met with chiefly in elderly persons of a weak, lax habit of body, or in such as are affected with scurvy or an anemic condition of system. It sometimes occurs in association with, or in consequence of, rubeola, smallpox, plague, and typhoid fever. The traumatic form is usually the result of a wound of the bladder, or of the rude and forcible use of instruments.

Persons affected with stone are very liable to suffer from hemorrhage of the bladder, especially after any rough exercise. Worms in the bladder have been known to cause profuse and even fatal hemorrhage of this organ. Violent concussion of the body, severe exercise on horseback, and venereal excesses, may be enumerated as among the more common causes of the affection.

A considerable hemorrhage of the bladder occasionally results from the use of drastic cathartics and irritating diuretics. Ulceration of the mucous and submucous cellular tissue of the organ is nearly always accompanied by bleeding, and one of the most characteristic signs of fungous, encephaloid, and erectile tumors, is a considerable flow of blood. Finally, vesical hemorrhage is sometimes vicarious of the menstrual flux, and of suppressed hemorrhoidal discharges. It also, though rarely, marks the crisis of other diseases.

When recently effused into the empty bladder, the blood is of a natural appearance; if, on the contrary, it has been retained for some time, or been mixed with the urine, it will be found to be of a dark-brownish, turbid, or muddy hue. In its consistence, the blood may be liquid, semi-fluid, or completely solid.

The *symptoms* of vesical hemorrhage are a discharge of blood from the urethra, either alone or in combination with urine, and accompanied, if the quantity is at all considerable, by a frequent desire to micturate, spasm at the neck of the bladder, and a burning sensation along the course of the urethra. When the blood coagulates nearly as fast as it is poured out by the bladder, it may lead to retention of urine. Copious effusions of this kind may be followed, sooner or later, by all the symptoms of exhaustion.

As hemorrhage of the bladder is liable to be mistaken for hemorrhage of the kidneys, the ureters, prostate gland and urethra, the *diagnosis* is sometimes extremely difficult, if not impracticable. In case of direct injury of the bladder, there need be no doubt. In the idiopathic form of the hemorrhage, however, great uncertainty must frequently exist. In such an event, the history of the case, and the absence of disease or injury of the associated organs, may assist in clearing up the obscurity, and in leading to a correct diagnosis. In renal hemorrhage, the disruption is usually dependent upon injury or organic disease of the kidneys, and is, therefore, generally preceded and accompanied by symptoms referable to these organs. The blood is of a pale, pink, or claret complexion, and either entirely fluid, or partly fluid and partly coagulated; it is never voided in a pure state, as it often is when it proceeds from the bladder, prostate gland, or urethra. The microscope also readily detects what are called blood-casts, consisting of blood moulded in the uriniferous tubes, and washed out by the urine. Moreover, the epithelium which accompanies it does not occur in flat scales, as when it proceeds from the bladder, but in small, spherical particles. Sometimes the blood is voided in whitish cylindrical clots, but, unless they are united with renal casts, they are of no diagnostic value. When the bleeding proceeds from the ureters, it is usually due to the presence of a [illegible] gives rise to the symptoms associated with the passage of [illegible] these conduits.

Hemorrhage of the urethra is generally produced by external [illegible] passage of a calculus, or the venereal orgasm, and the blood commonly [illegible] off in small vermiform pieces, without any material change of color, or [illegible] to void the urine. In many cases, the blood is discharged in drops, or in a [illegible] stream.

In the traumatic variety of hemorrhage, the ordinary hemostatics [illegible] course, indicated, and should be employed without delay. Accessible [illegible] are exposed and tied, or, when this is impracticable, compression and cold [illegible] cations are used. All offending causes are sought for, and, if possible, [illegible] When the bleeding proceeds from an encephaloid, fungous, or erectile [illegible] palliation alone is attempted. In such cases, our main reliance is upon [illegible] and lead, gallic acid, alum, and perchloride of iron, with acidulated [illegible] in the recumbent position, and cold applications to the perineum and hypogastrium. The catheter should be avoided.

In cases of vesical hemorrhage dependent upon fungous excrescences [illegible] bladder, I have generally succeeded in affording prompt relief by a [illegible] of calomel and rhubarb, followed by alum and opium, with sulphuric [illegible] infusion of roses as a common drink.

In idiopathic hemorrhage of the bladder, great attention must be paid [illegible] system. Vascular action is reduced, the bowels and secretions are [illegible] regulated, the diet must be light and unstimulating, and the drinks [illegible] cooling and acidulated. Absolute rest in the recumbent posture is of [illegible] importance. The most useful remedies are gallic acid, acetate of lead, [illegible] These articles ought usually to be combined with opium. Tannic acid and [illegible] of vitriol also prove highly efficacious. In hemorrhage caused by [illegible] lybeate tonics are indicated, and the best forms are the tincture of the [illegible] the sulphate, and the aromatic wine of iron. In bleeding of the bladder [illegible] rious of the menstrual flux, emmenagogues and aloetic purgatives are [illegible] In all cases, the action of internal remedies is promoted by refrigerant [illegible] tions to the perineum, the inside of the thighs, and the hypogastric [illegible] Cold enemata are also beneficial, and a lump of ice introduced into the [illegible] sometimes acts like a charm. Leeches, or cupping over the sacrum, [illegible] useful, when pain and spasm exist. Direct medication, by astringent [illegible] occasionally proves serviceable. If the blood coagulates so as to [illegible] bladder, it may sometimes be removed by injections with cold water, or, [illegible] still better, vinegar and water, after the clot has been broken up with a [illegible] catheter.

When all other means fail, and the symptoms are so urgent as not to [illegible] of further delay, the only resource is to open the bladder, as in the [illegible] lithotomy. When practicable, the lateral method should be performed, [illegible] clotted blood removed with the scoop.

POLYPOUS, FUNGOUS, ERECTILE, AND OTHER MORBID GROWTHS.

The bladder is liable to *polyps*, occurring chiefly in young subjects; [illegible] indeed, within less than two years after birth. An instructive paper, [illegible] the particulars of ten cases, including one seen by himself, was lately [illegible] by Mr. Birkett, of London. The growth described by this distinguished [illegible] geon was attached to the upper boundary of the neck of the bladder, from [illegible] it projected forwards into the urinary meatus. It was composed of lobes [illegible] lobules, was of a soft, friable consistence, not unlike certain nasal polyps, [illegible] was covered with epithelium, but was not very vascular. The patient was [illegible] five years of age.

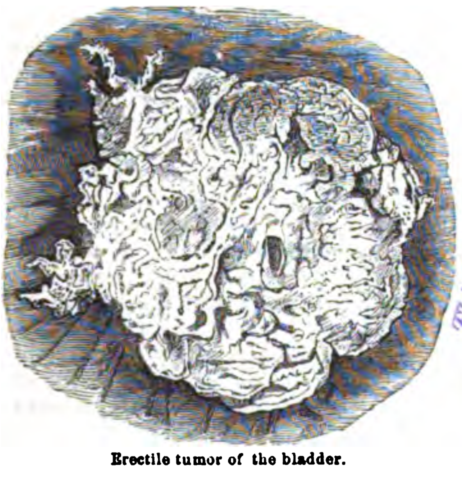
Dr. C. S. Bishop has kindly communicated to me the particulars of the [illegible] of a lady, aged fifty-six, from whose bladder he removed a cylindrical, [illegible] polyp, nearly three inches in length, by means of a double canula. It [illegible] globular head, eight lines in diameter, and was attached by a narrow pedicle to the bas-fond of the organ. Finding, at one of his visits, a portion of it projecting at the orifice of the urethra, he at once ligated it; and next day, after having satisfied himself of its precise situation by making traction upon the ligature while the index-finger rested in the vagina, he dextrously slipped a wire round its neck. At the expiration of forty-eight hours, he removed the mass by rotating the canula upon its axis. The principal symptoms were, frequent micturition, bloody urine, excessive pain, and sudden stoppage of water, as if the mouth of the urethra had been closed by a valve.

Various anomalous growths, known by the terms *fatty* and steatomatous, are sometimes observed in the bladder, but their occurrence is so rare that it is scarcely necessary to allude to, much less to describe, them. They seldom attain a large bulk, are generally situated in the bas-fond of the organ, and always exhibit the same structure as in other parts of the body.

A peculiar *fungous growth*, a species of vegetation of the mucous membrane of the bladder, is also occasionally met with. Varying in size from that of a pea to that of a pullet's egg, it is of a soft, spongy consistence, with a rough, fimbriated, or villous surface, and consists of a grayish, cellulo-fibrous tissue, covered by a prolongation of the lining membrane. Small vessels enter it in different directions, and are liable, when ruptured, to pour out a considerable quantity of blood. The only evidence of the existence of this disease is the presence in the urine of a portion of the abnormal substance.

Finally, tumors of an *erectile*, vascular character, similar to that of an anastomotic aneurism, or a maternal nevus, sometimes occur in this organ. The annexed drawing, fig. 463, taken from a preparation in the pathological collection of the New York Hospital, represents a growth of this description. The specimen was deposited by Dr. Cheeseman, to whom I am indebted for the following history of the case:—The patient, a widow, seventy-two years of age, was of a spare habit of body, and the mother of five or six children. Though naturally feeble, her general health had always been good until about three years before her death, when she began to complain of uneasiness in her bladder, attended with a frequent inclination to void her urine, which was always mixed with blood. Her symptoms gradually increased in violence; she became pale and anemic, and finally died completely exhausted. For some time before her death, she suffered severely from pain in the bladder during micturition, especially immediately after the passage of the last drops of water. She never experienced any retention, and the blood always came away in a dissolved condition. Upon dissection, a tumor was found upon the floor of the bladder, of a

Fig. 463.



Erectile tumor of the bladder.

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soft, spongy character, of a florid color, circular in form, and about two inches in diameter. It seemed to spring from the mucous membrane, and had a rough, irregular surface, not unlike that of a cauliflower. The parts around were free from inflammation and other disease; but the muscular tunic was somewhat thickened and reticulated. All the other organs were healthy.

Of the exciting causes and diagnostic characters of polypous, fungous, steatomatous, and other tumors of the bladder, nothing, unfortunately, is known. From the constant pains in the pelvic region, with the straining efforts, and the frequent inclination to void the urine, which are almost always present, the existence of stone is apt to be suspected; an apprehension which is not always relieved by sounding, which, however, should never be omitted in cases of a doubtful nature. Whenever their real character can be ascertained, the bladder should be laid open as in the common operation of cystotomy, and their removal effected with a pair of probe-pointed scissors curved on the flat.

No internal remedies exert the slightest influence in arresting these tumors, or in modifying their development. Hence, all that can be done, when the disease cannot be reached by operation, is to endeavor to palliate the patient's suffering by anodynes, and such other means as his actual condition may, from time to time, seem to require.

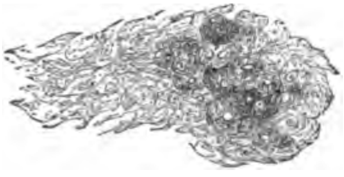
HETEROLOGOUS FORMATIONS.

The bladder is liable to malignant diseases, as scirrhus and encephaloid, or hard and soft cancer. Of colloid and melanosis, as occurring in this organ, hardly any cases have been published. I have myself seen only one example of the latter, the patient being a man, fifty-eight years of age. The disease, which presented itself in the form of five or six little nodules, coexisted with melanosis in nearly all the principal organs of the body.

Scirrhus.—Scirrhus, properly so called, of the bladder is extremely uncommon. I have met with only three well-marked cases of it. It has hitherto been chiefly observed in men, between the ages of forty-five and sixty, at the neck and bas-fond of the viscus. It occasionally coexists with scirrhus in other organs, as the liver, uterus, breast, and prostate gland. During the progress of this disease, the associated structures are apt to become implicated.

There are no signs by which scirrhus can be distinguished from other diseases of the bladder. The most reliable evidences are, the peculiar lancinating character of the pain, the progressive emaciation, the wan and sallow state of the countenance, the age of the patient, the excessive burning at the neck of the organ and in the urethra immediately after micturition, and the occasional discharge of small fragments of the heterologous matter. These, if examined with the microscope, will be found to display the usual characteristics of such formations, and will, of course, at once remove all doubt respecting the nature of the disease. The matter from which the accompanying drawing, fig. 464, was taken, was invested with numerous scales, and was very vascular internally, the vessels being arranged in loops. Negative testimony is afforded by sounding. No positive conclusion can be drawn from the frequent micturition, the condition of the urine, and the presence of mucus, pus, or puriform fluid.

Fig. 464.



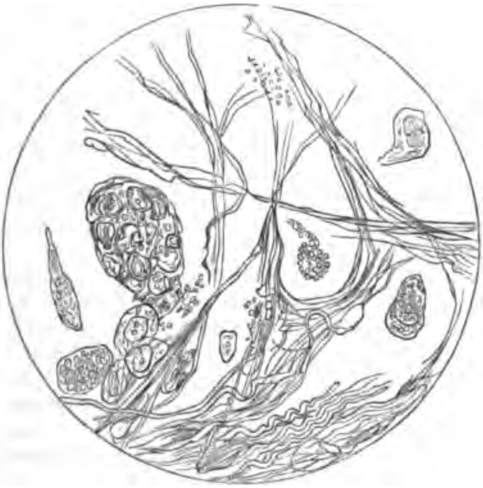
Microscopical structure of scirrhus of the bladder from a granulation discharged in the urine.

The suffering in this disease is generally so excessive as to require enormous doses of morphia, both by the mouth and rectum, for its relief. In one of my cases, the pain was more severe than I have ever witnessed in any other affection. Towards the close of the disease, anodynes produced so little effect that the patient, a gentleman, forty-four years of age, was obliged to be kept almost constantly under the influence of chloroform. The dissection showed an ulcerated scirrhus of the bas-fond of the bladder.

The nature, progress, and termination of scirrhus of the bladder are well illustrated in the history of the case of a gentleman, aged thirty, whom I attended along with Dr. Washington L. Atlee. The attention of the patient was first attracted to his disease in October, 1858, by an appearance of blood in his urine. During the following winter and spring he had several attacks of a similar but more severe kind, and they continued gradually to increase until July, when they became very frequent. They were now attended with violent pain in the bladder and excessive difficulty of micturition. A sound inserted into the organ failed to detect any calculi, but early in 1860 several concretions of a phosphatic character were voided, always with considerable pain, straining, and tenesmus. By the middle of March, the patient was obliged to relieve himself every fifteen, twenty, or thirty minutes. The urine, mixed with blood, was excessively fetid, and contained a large quantity of thick, ropy mucus; it had an alkaline reaction, and presented, after standing a while, a copious, brownish, dirty-colored deposit. Micturition was accompanied with agonizing suffering. The pubic region was tender on pressure, and, for some distance around, dull on percussion. The introduction of a sound gave great pain, and the point of the instrument invariably inclined towards the left side of the middle line. The posterior wall of the bladder, felt through the rectum, was very hard and tender to the touch. Gradually constant dribbling of urine set in, the stomach became excessively irritable, and the patient died, completely exhausted, on the 16th of May, after having vainly used a great variety of remedies. During the last few weeks of his life, he was kept more or less constantly under the influence of anodynes and chloroform. The urine continued alkaline, muco-purulent, and highly fetid to the last.

The bladder was inseparably united to the anterior wall of the abdomen, to the rectum, and to a fold of the small bowel. Its inner surface was in a scirrho-cancerous condition, and ulcerated in its entire extent. The coats were from half an inch to an inch in thickness. The mesenteric ganglions were loaded with cancerous matter. The rest of the body was sound. The microscopical characters of the carcinomatous formation of the bladder are accurately represented in fig. 465, from a drawing by Dr. Packard.

Fig. 465.



Microscopical characters of cancer of the bladder.

Encephaloid.—Encephaloid of the bladder, likewise known by the name of fungus hematodes, soft cancer, or medullary sarcoma, usually runs its course with great rapidity, destroying life in from nine to twelve months. Any part of the organ may be affected with it, but its most common situation is [illegible] the neck, between the mouth of the urethra and the outlets of the ureters. It may occur as a solitary tumor, projecting into, and almost filling up, the bladder, or in the form of small nodules, from the volume of a pea up to that of a [illegible]. The starting-point of the disease is always the submucous cellular tissue.

Tumors of this kind are occasionally associated with calculi, which are either partially imbedded in their substance, or else lie loose in the bladder. When of large size, they encroach so much upon the organ as to leave hardly any room for the urine. In most cases of encephaloid, the intermediate substance of the bladder is perfectly healthy; in others it is diseased and hypertrophied. Sometimes the organ is very much contracted, while at others, though rarely, [illegible] greatly enlarged.

The most characteristic symptoms are, uneasiness about the neck of the bladder, frequent micturition, a bloody state of the urine, a discharge of [illegible]form matter, and a peculiar cachectic state of the countenance. When all these phenomena are present, no reasonable doubt can be entertained respecting the nature of the case. Still, as error may possibly arise, the practitioner should never rest satisfied until the bladder has been thoroughly explored with the sound. Should no calculus be detected, it will afford additional proof of the existence of encephaloid. The operation, it may also be stated, is generally attended, in the latter case, with considerable hemorrhage. The tumor may also be perceived by the finger in the rectum. A microscopic examination of the suspected matter frequently affords useful information.

Mitigation of suffering is all that can be aimed at in this disease. The principal remedies, of course, are anodynes, in full and sustained doses. To check the hemorrhage which always attends the ulcerative stage, it will be necessary to make free use of perchloride of iron and opium, acetate of lead, alum, tannin, creasote, and similar articles. When the discharge is obstinate, or unusually copious, astringents may be thrown into the bladder.

TUBERCULOSIS.

The bladder is sometimes the seat of tubercular disease. The deposit is commonly met with in the form of minute granulations, similar to those which occur in the bowels and lungs. Their number is generally small. It is probable that they may occur in any part of the bladder, but they are by far most common at the neck and bas-fond of the organ.

The seat of this deposit is in the mucous follicles, in the substance of the mucous membrane, and in the submucous cellular tissue. After the tubercle has existed for an indefinite period, it begins to soften, and is finally entirely broken down and expelled, leaving, in its stead, a small, roundish ulcer, with [illegible] ragged, and undermined edges.

Tuberculosis of the bladder is generally, if not invariably, associated with tuberculosis in other parts of the body, especially the kidney and the prostate gland. Its coexistence with phthisis is uncommon.

There are, unfortunately, no symptoms by which we can, with any certainty, determine the existence of tubercular disease of the bladder. As long as the deposit remains in a state of crudity, there is, in general, merely a slight degree of irritability of the mucous membrane, with increased frequency of micturition. When softening has commenced, the peculiar matter of tubercle is discharged along with the urine, in which it may often be detected with the naked eye. When any doubt exists, a small quantity should be placed under the microscope.

The ulceration attending this disease occasionally spreads over the whole mucous surface, which is gradually removed in as clean and perfect a manner as if it had been dissected off with the knife. Several specimens, illustrating this condition, are contained in my private collection. When the case has reached this point, the suffering is most excruciating, there being a constant desire to pass water, and the patient being rapidly worn out by the conjoint influence of pain and want of appetite and sleep. Palliation by anodynes, in full and sustained doses, is all that the disease admits of.

CYSTOCELE OR HERNIA.

The bladder, like the other abdominal viscera, is liable to protrude from the pelvic cavity, constituting what is denominated cystocele. A hernia of this description is sometimes complicated with a bubonocele or rupture of the groin, which it may either precede or follow. Occasionally the protruded organ contains a stone.

The cystic hernia is destitute of a proper sac. The only exception to this rule is where the rupture is of long standing, or of great bulk, when the fundus of the bladder may drag the perineum down into the scrotum. The swelling is always formed, in great measure, by the superior portion of the viscus, and is generally of small size, though occasionally it has been known to attain the magnitude of a fist.

A cystocele is a soft, elastic, and fluctuating tumor, which varies in its size according to the amount of urine contained in the protruded part. When examined in a dark room, with the aid of a candle, it appears translucent, very much like a hydrocele.

The *diagnosis* is a matter of great importance, as a tumor of this kind has occasionally been cut into by mistake. The most decisive symptom is the change which the swelling undergoes in its volume during micturition. As the water flows off the tumor decreases, or entirely disappears, to recur again, however, as soon as the urine has re-accumulated, to some extent, in the protruded part. A cystocele has not the doughy, inelastic feel of an omental hernia, nor the soft, gaseous feel of an intestinal one, nor does it return with that peculiar gurgling noise which accompanies the ascent of the latter.

The *treatment* of cystocele, seated in the groin or scrotum, does not differ from that of intestinal hernia. When the tumor is reducible, it should be kept up by means of an appropriate truss; but when the viscus has contracted adhesions, and no longer admits of reposition, the patient must be contented with a suspensory bag. The urine which accumulates in the lower part of the sac must be discharged by raising and compressing the tumor during micturition. If retention should take place, and relief cannot be afforded by the catheter, the part should be punctured. If calculi collect, and become a source of great suffering, they may be extracted by incision of the sac.

MORBID CONDITIONS OF THE URINE.

The urine, both in disease and injury, often deviates in a remarkable degree from the normal standard. The most important alterations to which it is liable are referable, first, to its color, odor, and consistence; secondly, to its quantity and specific gravity; thirdly, to an increase of its more important normal constituents; and, fourthly, to its admixture with various extraneous substances, as blood, fibrin, albumen, pus and spermatic fluid.

1. Naturally the urine is of a light amber *color*, or of the color of pale sherry, especially if water has been largely used. The fluid that is voided in the morning is generally a few shades darker, and during the progress of disease it not unfrequently assumes a deep complexion, so as fully to justify the word high-colored, then so commonly applied to it. In certain affections of the bladder and kidneys, particularly in chronic cystitis, it is sometimes remarkably dark, either at the moment it is passed, or after it has stood awhile. A whitish, milky, or lactescent appearance of the urine is usually indicative of imperfect assimilation. Bile renders the fluid yellowish; blood, reddish; melanic acid, blackish. A bluish urine is sometimes observed, owing to the presence of some unknown coloring matter. Various articles of diet and of medicine impart their specific hue to the renal secretion.

In inflammatory affections, as the different forms of fever, gout, rheumatism, pneumonia, pleurisy, erysipelas, wounds, and hectic irritation, the urine is always abnormally red. In nervous diseases, as hysteria, epilepsy, and hypochondriasis, it is remarkably clear, if not actually limpid. In diabetes, in which the fluid is often thrown off in vast quantities, the color is very pale. Urine depositing cystine generally exhibits a peculiar yellowish tint, similar to that of honey.

The *odor* of this fluid is naturally a little aromatic, not unlike that of healthy perspiration, without acidity or alkalinity. In certain diseases, it becomes remarkably fetid, occasionally even before it is voided, and always after it has stood for some time in the receiver. Asparagus, garlic, cubebs, turpentine, valerian, gin, and other articles invariably impart their peculiar odor to it. In diabetes it has a whey-like smell, while in the cystine diathesis it resembles the odor of the sweet brier. In injuries of the spine, and in disease of the bladder, dependent upon calculus, stricture of the urethra, or enlargement of the prostate gland, it generally exhales a most offensive ammoniacal odor. Sometimes the smell strongly resembles that of putrid cabbage, owing, probably, to the disengagement of sulphuretted hydrogen.

The *consistence* of urine is subject to much diversity, and often affords important diagnostic information. An aqueous state of this fluid is generally denotive of nervous disease; it is commonly associated with lightness of color, and low specific gravity. In inflammatory affections, whether idiopathic or traumatic, the urine is usually very thick, owing to the presence of an abnormal quantity of mucus, lithic acid, and other extraneous matter. In disease of the urinary apparatus, especially chronic cystitis, inordinate consistence is generally combined with remarkable viscidity.

2. The *quantity* of urine excreted by a healthy adult, in the twenty-four hours, is from 35 to 40 ounces, from which it may range from 20 ounces, as the minimum, to 50 ounces, as the maximum. In diabetes it often amounts to several gallons during this period for days together; it is also frequently very abundant in nervous diseases, particularly in hysteria. In inflammatory affections, on the other hand, the quantity is always greatly diminished, especially during the early stages of the attack. In dropsy, there is generally a remarkable deficiency of urine, the quantity being often less than one-sixth the normal standard.

The *density* of the urine is liable to be influenced by various circumstances. On an average, it is about 1022.5 in the healthy state. It is increased by copious perspiration, free exercise, heat, dry food, and all articles containing much azote; diminished by the liberal use of water, the lighter wines, malt liquors, vegetable food, cold, and sedentary habits. In disease, it varies from 1001, as the minimum, to 1055, as the maximum.

3. An increase or diminution of the normal constituents of this fluid is of frequent occurrence, and therefore capable of affording valuable diagnostic information.

The *water* of the urine, as it naturally exists in greater abundance than any other ingredient, amounting generally to about 933 parts in the 1000, is subject to remarkable changes. In nervous affections, especially in such as partake of a hysterical character, the fluid is always very copious, as well as very thin and limpid. In diabetes insipidus, it is highly aqueous, and is excreted in enormous quantities; it is destitute of urea, and deposits, on evaporation, a yellow-brownish syrup, devoid of crystals, and possessed of a very feeble acid reaction. In general, comparatively little water exists in the urine in inflammatory affections.

The amount of *urea* voided in the twenty-four hours varies with the nature of our food, drink, exercise, and health. A purely animal diet affords, according to Lehmann, 821 grains, a mixed 501, a vegetable 347, and a non-nitrogenous 237. Urea is furnished very sparingly in certain diseases, as chronic hepatitis, granular degeneration of the kidneys, dyspepsia, phthisis, gout, rheumatism, and inflammatory fevers. Sometimes the kidneys refuse to secrete it, and then, as it is retained in the blood, it acts as a poison, causing headache, nausea, depression, and convulsions; in fact, all the phenomena of uremic disturbance, speedily followed by death.

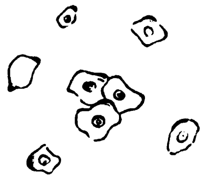
The *acid* of the urine is most abundant for some time after the completion of digestion; during the continuance of this process, the quantity is very slight, or the fluid may even exhibit an alkaline reaction, especially if the meal has been a vegetable one. As a general rule, it may be stated to be in an inverse ratio to the amount of gastric juice. Errors of diet, and whatever has a tendency to impair the powers of the stomach or to dry up the cutaneous perspiration, increase the acid of the urine. Hence, it is generally present in undue quantity in dyspepsia, gout, rheumatism, and in intermittent, traumatic, and other fevers. It is also very much augmented by the internal use of various kinds of acids, as sulphuric, nitric, phosphoric, and tartaric.

An *alkaline* condition of the urine is met with in various states of the system. It is generally present, in a very high degree, in disease of the urinary apparatus, dependent upon injury of the spinal cord, or mechanical obstruction of the urethra, leading to hypertrophy and chronic inflammation of the bladder. The pus which is formed in such cases by the affected mucous membrane acts as a kind of ferment, causing decomposition of the animal matter, and thus completely depriving the urine of its acid. A purely vegetable diet soon renders the urine alkaline; and a similar effect is occasioned by the exhibition of the salts of soda and potassa. An alkaline condition of this fluid, then, is not necessarily inconsistent with health; it is only, or chiefly, when it is associated with the presence of carbonate of ammonia or the phosphates that it should be regarded as pathological.

The *mucus* which naturally exists in this fluid is greatly augmented in certain diseases. In cystorrhœa, for instance, it is so abundant as to impart to this affection its characteristic feature. When this substance is thrown off in inordinate quantity, it is generally very thick and ropy, and so tenacious as to adhere more or less firmly to the bottom of the receiver. The urine with which it is associated is usually alkaline, and remarkably prone to decomposition, even in the bladder. When the disease upon which it depends is at all severe, or of long standing, it is nearly always intermixed with pus and fibrin, and sometimes even with phosphatic matter.

During health the lining membrane of the genito-urinary organs is constantly engaged in throwing off *epithelium*, the quantity of which is always materially increased when there is serious disease of these structures. The cells are of variable size, and of an oval, or irregularly angular and flattened shape, with a well marked central nucleus; sometimes they are broken up, and disposed in patches or lamellated plates, as in fig. 466. They frequently occur in combination with oxalate of lime, and in certain affections, especially organic disease of the kidneys, they contain oil globules.

Fig. 466.



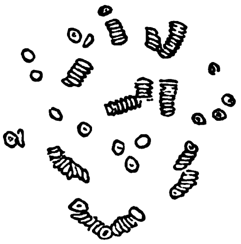
Epithelium.

4. Various substances may find their way into the urine, either through accident, injury, or disease. Of these the most important, practically considered, are blood, fibrin, albumen, pus, and spermatic fluid.

The presence of *blood* in this fluid may be due to various causes, as injury and ulceration of the genito-urinary apparatus, a renal or vesical calculus, or the existence of an encephaloid, fungous, or erectile tumor. It may generally be readily detected, especially if recently effused, by the reddish color which it imparts to the urine, by its tendency to subside to the bottom of the receiver, and by its alkaline properties. The most infallible plan, however, is to place a little of the suspected fluid under the microscope, which, if it contain blood, will at once detect the peculiar corpuscles of that substance, as displayed in the annexed sketches, figs. 467 and 468, the former representing these bodies in an aggregated, and in the latter in a separate and partially disorganized, state.

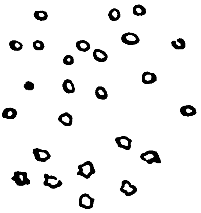
Fibrin, plasma, or lymph, is nearly always present in the urine in serious disease of the kidney and bladder. It frequently occurs in distinct flakes, fragments, or little masses, of a whitish or drab-colored appearance, and under the microscope always exhibits the peculiar features of that deposit. In renal affections

Fig. 467.



Aggregated blood corpuscles.

Fig. 468.



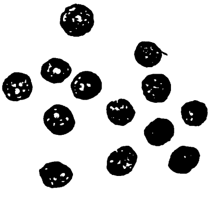
Isolated blood corpuscles

fibrinous casts are often found in the urine, generally in association with pus corpuscles, blood disks, oil globules, and epithelial cells.

Albumen exists in the urine in many affections, both of the kidneys and of other organs. It is often present in traumatic and idiopathic fevers, pneumonia, dropsy, phthisis, and even in prurigo. It is generally very abundant in Bright's disease, of which it forms a characteristic feature. The urine with which it is associated is of low specific gravity, from deficiency of urea and salts, of a pale, opaline color, and readily coagulable by heat and nitric acid.

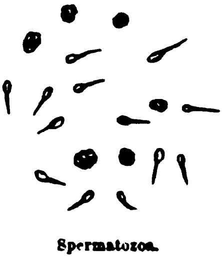
Pus is a very common ingredient of urine, and is generally denotive of serious disease of the genito-urinary apparatus. Its presence, however, may be purely accidental. The urine with which it is combined always contains albumen and mucus, is more or less turbid in its appearance, readily putrefies, and generally affords an alkaline reaction. After the fluid has stood for a while, the pus collects at the bottom of the receiver, as a yellowish, homogeneous stratum, of variable thickness. Under the microscope it exhibits the characteristic globules, delineated in fig. 469.

Fig. 469.



Pus corpuscles.

Fig. 470.



Spermatozoa.

Seminal fluid is, perhaps, more frequently present in this fluid than is generally supposed. More or less commonly exists in all confirmed cases of spermatorrhœa. The microscopical appearances are well shown in the accompanying sketch, fig. 470.

Besides these ingredients numerous others are often found in the urine, as bile, sugar, oil, cystic and xanthic oxides, oxalic acid, carbonate of ammonia, and the triple phosphates. A few cases have been met with in which this fluid contained hairs, short, destitute of bulbs, commonly of a light color, and combined with an excessive secretion of white, chalky matter. Their source has not been determined. The probability is that they are sometimes derived from the ovary.

The *examination* of the urine with a view to the detection of its more important morbid changes demands skill and patience. The apparatus required for the purpose consists of a microscope, a urinometer, several test tubes, and a spirit-lamp, with a few chemical reagents. Simple inspection with the unassisted eye is seldom satisfactory.

The urine usually selected for investigation is that passed in the morning. Of this from four to eight ounces should be put into a white, well-corked vial, in which it should remain undisturbed for at least two hours, in order to afford an opportunity for the separation of its constituents. A note is now made of its color, the appearance of the floating matter, and the nature of the deposit. The fluid being next decanted into a tumbler, it will be easy to determine its odor and consistence. If it be acid, it will turn blue litmus paper red, and red litmus paper blue if it is alkaline. A reddish brick-colored sediment indicates an excess of acid. If the alkali is fixed, the blue tint will be permanent; but if it is occasioned by the presence of ammonia the test paper will resume its original hue on the application of gentle heat. Mucus, pus, and blood, especially if existing in large quantity, may generally be readily detected with the naked eye; but the most satisfactory result is always furnished by the microscope, a drop of the fluid being placed upon a glass under the field of the instrument. The characteristic properties of these substances have already been pointed out. The epithelium found in the urine may proceed from the kidney or the bladder; in the former case, the cells are small and more or less spherical, in the latter flat and scaly. Doubt may arise as to the source of the blood, but this may generally be satisfactorily solved by the presence or absence of renal casts.

The best tests for albumen are heat and nitric acid, the former coagulating it, the latter throwing down a white precipitate. Deception, however, may arise: thus, if phosphates exist in the fluid, heat may cause a deposit resembling albumen; but this may readily be dissipated by the addition of a little nitric acid, if the turbidity is owing to the earthy salts, whereas it will be permanent if caused by animal matter. Again, albumen may be present, but the urine being alkaline, no coagulation may occur. When this is the case, the fluid should be slightly acidified with vinegar before it is boiled. Finally, nitric acid may produce a precipitate when there is no albumen, but simply an admixture of urates. The addition of heat promptly clears the urine.

Urea may be detected by adding to urine, contained in a watch-glass, an equal bulk of colorless nitric acid. If it exists in excess, irregular rhomboidal crystals of nitrate of urea, of a pearly lustre, and easily recognizable with the microscope, will speedily form, whereas, if the quantity is very small, they will not show themselves for some time.

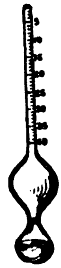
The presence of *bile* is ascertained by mixing a drop of nitric acid with a small quantity of urine on a white plate, and observing the play of color that takes place, passing more or less rapidly from green to blue, violet, red, yellow, and even brown.

For the detection of *sugar*, the most simple test is Moore's. It consists in boiling urine with an equal quantity of the officinal solution of potassa. If saccharine matter exists, the mixture assumes a dark-brown color, which increases in intensity with the extent of the ebullition and the amount of adventitious substance. The urine which accompanies this formation is remarkably clear, aqueous, and of high specific gravity.

Fatty matter exhibits, under the microscope, transparent characteristic oil globules. Its existence may also be detected by ether, by adding an equal quantity to the suspected urine, and then gently evaporating the mixture. The residue will be greasy, immiscible with water, and pervaded with oil globules. The urine, when much of this substance is present, is of an opaque, milky aspect.

The *specific gravity* of this fluid may readily be determined with a urinometer, sketched in fig. 471, floated in a tall, narrow cylindrical vessel, containing about six ounces of urine. The number on the graduated stem, on the level of the fluid, will, if added to 1000, express the specific gravity. A specific gravity bottle will afford a still more accurate result. It should be capable of holding 1000 grains of distilled water at a temperature of 60° of Fahrenheit. The vessel, being counterpoised, is filled with urine, the weight of which will represent its specific gravity.

Fig. 471.



Urinometer.

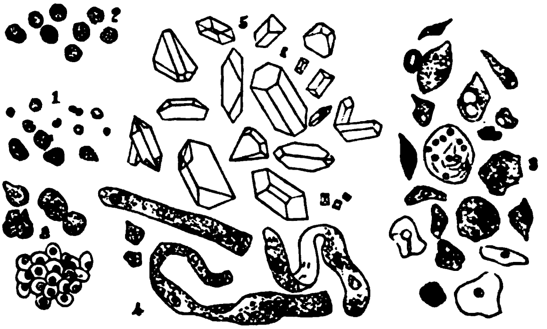
For a more full and detailed account of the morbid conditions of this fluid, and the various methods of detecting them, than is consistent with the scope of this work, I must refer to the admirable monographs of Frick, Bird, Beale, and Thudichum.

URINARY DEPOSITS.

The only deposit in perfectly normal urine is a slight amount of mucus and epithelial débris, which gradually subside as a delicate cloud as the fluid cools; but in various abnormal conditions of this excretion, either from excess of its constituents, from a hyperacid condition, or, again, from an alkaline state, owing either to the fixed or volatile alkalies, we find other precipitates. The most common of these are, first, uric acid, either pure or combined with some bases; secondly, phosphatic acid, as the phosphate of lime, the phosphate of magnesia, or what is called the triple phosphate, consisting of a combination of phosphoric acid with magnesia and ammonia; thirdly, oxalic acid, in combination with lime; and fourthly, cystine and xanthine. The latter two substances, however, are very infrequent.

The different urinary deposits, including renal casts, are beautifully illustrated in fig. 472. The grouping is so arranged as to afford, at a single glance, the characteristic features of every substance found in the urine, except what may result from the admixture of certain abnormal growths, benign and malignant. At 1 are seen small globules, consisting of blood, nuclei, delicate epithelial cells, and spherules of oxalate of lime; at 2, pus globules; at 3, typical epithelial cells from the bladder, pointed at each extremity, with a central nucleus, the younger being rounded and pellucid, the older flattened, and often full of oil or granules; at 4, fibrinous casts from the kidney, entangling a few epithelial cells; and at 5, triple phosphate.

Fig. 472.



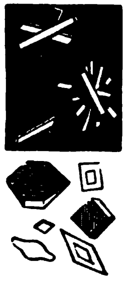
Urinary deposits grouped together.

1. *Uric acid* appears as a deposit in crystals, under varied forms, some of which are a modification of the rhomboids. The urates present themselves as amorphous sediments, of which there are two, the yellow and the red. The color, in the former, is probably owing to hematine; in the latter, to a peculiar pigment, termed purpurine.

Both uric acid and the urates are distinguished from all other deposits by their behavior with nitric acid, on the addition of a drop of the concentrated fluid to a small quantity of the secretion. The first perceptible effect is an effervescence, followed by solution; and on drying the mass carefully over a spirit lamp, a beautiful crimson tint is produced, termed murexin. The color is much heightened by subjecting the residue to the fumes of ammonia. The two deposits are also readily distinguished from each other.

The *crystallized sediments*, red sand, or gravel, consist of lithic acid, nearly in a pure state. They appear in the form of minute particles, resembling very much, in shape, size, and color, the particles of Cayenne pepper. Heat does not dissolve them, as it does lithate of ammonia. Under the microscope, they are found to consist of exceedingly delicate crystals, most of which have the appearance of rhombic prisms, which may, therefore, be presumed to be their normal form. The most perfect specimens are generally contained in the deposits of yellow sand in the urine of young infants. The crystals are sometimes nearly square; or they are very thin, and longer than broad, so as to represent square tables; or, finally, they are so thin as to appear merely like pale, lozenge-shaped lamellæ. Occasionally they lie across each other, and are firmly coherent.

Fig. 473.



Uric acid crystals.

The *lateritious sediment*, as it is termed, is colored by the pigment of the urine, and is composed of urate of soda, in union with a small proportion of urate of ammonia and lime.

The urates appear as a colored, amorphous deposit, and are redissolved on heating the urine, which is not the case with uric acid. An excess of the yellow deposit may generally be regarded as denotive of disturbance of the digestive functions, or disorder of the cutaneous transpiration. The urine depositing this substance is of a pale amber tint, more or less acid, and clear when voided. Its quantity is commonly confined within the natural limits, its specific gravity ranging from 1.015 to 1.025.

The red deposits are always present in those states of the system which are attended with imperfect assimilation, or a want of proper aeration of the blood. The pink sediment, described by Prout, is merely a variety of this; it is exceedingly rare, and is generally expressive of organic disease of the lungs, liver, or spleen.

The crystallized sediments are generally produced under the influence of a luxurious, indolent life, attended with dyspepsia, flatulence, acidity, and constipation of the bowels, with disorder of the cutaneous secretion.

In the *treatment* of this affection, it is important to ascertain, if possible, the causes by which it has been induced. It may be assumed, from what was previously stated, that these deposits are all dependent upon the retention in the system of nitrogenous principles, which, in consequence of derangement of the cutaneous and other emunctories, are obliged to pass off by the kidneys. The causes which may conduce to this result are—1st. Imperfect assimilative action; 2dly. The use of unwholesome food and drink; 3dly. Defective oxygenation of the blood from disorder of the lungs and skin; and, 4thly. Congestion, irritation, or inflammation of the urinary apparatus.

The first indication is to improve and invigorate the state of the digestive organs; 1st, by attention to the patient's diet, and, 2dly, by a proper regulation of his bowels. As a general rule, no articles of food should be permitted that are known to disagree. All kinds of pastry, fresh bread, and oily, fatty, and saccharine substances, should be interdicted. Boiled fish, raw oysters, and the white meats, may be used in moderation once a day. For breakfast and supper, the latter of which should always be very light, brown bread, dry toast, or soda biscuit, with a small quantity of butter, and a cup of black tea, will generally be sufficient. At dinner, green vegetables and ripe fruits may be indulged in, provided they do not impede the digestive process, or create flatulence and acidity. They promote the peristaltic action of the bowels, and furnish the urine with alkaline matter, thus preventing the deposit of gravel or lithic acid. Beef, pork, and mutton, if used at all, should be taken very sparingly. An important rule is to masticate as thoroughly as possible, to eat slowly, and not to overload the stomach, or overtask the powers of this organ. Coffee, beer, and alcohol should be eschewed. If the patient has been accustomed to the use of wine, he should either be obliged to discontinue it entirely, or limit himself to a little dry sherry or Madeira at dinner, though brandy and gin are far preferable. Hard water must be avoided. Some mild aperient, as blue mass and rhubarb, should occasionally be given to regulate the bowels. Active purgation is rarely required or proper. When there is much acid in the stomach and bowels, Castile soap may advantageously be united with the cathartic medicines.

Exercise should be taken at stated periods, in the open air, on foot, on horseback, or in a carriage. A valuable rule is never to carry it to fatigue, or to take it immediately after a meal.

It is a matter of primary importance to maintain the skin in a habitually clean and pure condition. In warm weather, sponging with cold water, either plain or impregnated with salt, mustard, alcohol, or red pepper, followed by dry friction, should be used, and, provided there is no contra-indication, the same plan be pursued in winter. Cold ablutions are more invigorating than warm. They are, in fact, to the external surface what cold air is to the lungs. Nevertheless, a warm bath is occasionally highly beneficial, especially during a fit of the [illegible]

The body and bedclothes should be frequently changed and aired, the body should be protected both summer and winter with flannel, and the patient should avoid exposure to cold.

When the lithic deposit is connected with a gouty or rheumatic diathesis, recourse must be had to colchicum, preceded and accompanied by mercurial cathartics. Not unfrequently it is necessary to administer mercury in alterant doses until slight ptyalism is produced.

When tonics are required, the best articles are quinine, iron, and the mineral acids, particularly the nitric and nitromuriatic. The vegetable acids are also beneficial. Both kinds may be exhibited, either alone or in combination with some of the vegetable bitters.

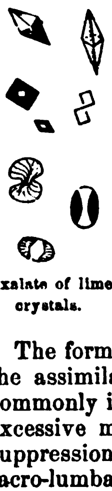
Bicarbonate of soda and of potassa, either alone or together, may be used to relieve acidity. The best time of exhibition is about an hour after meals. Phosphate of soda, liquor potassæ, and benzoic acid, are also valuable remedies.

Irritation of the urinary organs, especially if inflammatory, may be relieved by the application of leeches, cups, and blisters to the lumbar region, sacrum, and perineum. The warm bath will also be useful, and anodyne injections may be used to afford prompt relief.

Opiates have a happy effect in controlling the excretions in question, in curing the milder, and mitigating the distress in the more severe, forms. Morphia, lupulin, and hyoscyamus, are the best of this class. When the skin is disordered, Dover's powder may be administered.

2. The *oxalic deposit* holds, in point of frequency, an intermediate rank between the lithic and phosphatic. It occurs in the form of a white, glistening powder, which is suspended in the urine, and manifests no disposition to precipitate itself, unless it can attach itself to some substance capable of constituting a nucleus. Examined with the microscope, this powder is found to consist of beautiful, transparent crystals, of an octohedral figure, with sharp and well-defined edges and angles. Occasionally, though rarely, they are shaped like dumb-bells, or like two kidneys united at their concavities, and so closely approximated as to appear almost circular, as in fig. 474. They vary much in size, but, in general, they are exceedingly minute. If they are subjected to ignition on platinum foil, the oxalic acid is decomposed, and a small quantity of carbonate of lime is left, which is readily dissolved with effervescence on the addition of dilute nitric acid. *Oxalic acid* sometimes occurs as a distinct deposit, in the form of a small concretion resembling a hemp-seed, which may be retained in the bladder, and go on gradually increasing until it constitutes a mulberry calculus.

Fig. 474.



Oxalate of lime crystals.

The formation of oxalic acid is favored by whatever has a tendency to impair the assimilative powers and to exhaust the vital energies. Hence, it is most commonly induced by errors of diet, or the use of unwholesome food and drink, excessive mental exertion, inordinate venery, exposure to cold, long continued suppression of the cutaneous perspiration, and injury of the spinal cord, brain, or sacro-lumbar nerves. The immediate agency in its production is not yet entirely settled, but the experiments of Wöhler, Liebig, and Frerich render it more than probable that it is due to the oxidation of the uric acid. Certain articles of food, as rhubarb, sorrel, and tomato, also promote its appearance in the urine.

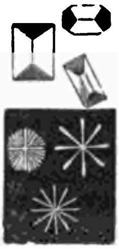
The *symptoms* of this affection are such as generally indicate the presence of derangement of the digestive organs and of the nervous system. Dyspepsia often exists in a marked degree; flatulence is of common occurrence; the mind is often gloomy and despondent; the temper is fretful; the surface is exceedingly susceptible to external impressions; the extremities are almost constantly cold; the sleep is disturbed by disagreeable dreams; and the patient continually broods over his disease, having a thousand misgivings, and the most horrible forebodings; pain in the loins is a frequent symptom; the sexual power is usually much impaired; and the urine is often voided with uncommon frequency, as well as with more or less heat and smarting. As the disorder advances, the patient becomes excessively emaciated, and ultimately falls into a state of confirmed hypochondriasis. Serious pulmonary suffering is sometimes present, and in many cases the skin is covered with boils and scaly eruptions.

In the *treatment* of this disorder, the first thing to be done is to improve the general health. The diet should be regulated, and those articles which produce acidity and flatulence should be carefully avoided. The body should be well protected with clothing, and the skin, washed daily with tepid salt water or some other stimulating fluid, thoroughly rubbed with a coarse, dry towel, or a flesh brush. In warm weather cold ablutions may be used. If there is much debility, tonics are indicated, such as quinine and sulphate of iron, in combination with capsicum and hyoscyamus. Sulphate of zinc in the dose of one grain, two or three times a day, occasionally answers an excellent purpose. The mineral acids, as the dilute nitric and nitromuriatic, also possess valuable tonic properties.

3. The *phosphatic deposit* is characterized by its whitish color, by its pulverulent arrangement, by its solubility in dilute hydrochloric acid, and by its insolubility in ammonia and liquor potassæ. It presents itself under three distinct varieties of form, the triple, the calcareous, and the mixed, each of which demands succinct notice.

a. The *triple phosphate* consists of phosphate of ammonia and magnesia, on which account it is generally called the ammoniaco-magnesian phosphate. It commonly occurs in minute white crystals of a beautifully brilliant aspect, transparent or opaque, and remarkable for their sharp angles and edges. In their form, these crystals exhibit great diversity, but in most cases they are prismatic. Occasionally they have a stellar, penniform, or foliaceous arrangement, as in fig. 475. They often float on the surface of the urine, especially if it is partially decomposed, and look like an iridescent film of grease. The urine which accompanies this deposit is preternaturally copious, pale, or whitish, and of low specific gravity, ranging from 1.005 to 1.014. It has a faint, sickening smell, which soon becomes ammoniacal and offensive. In some instances of the affection the fluid is unnaturally dark, brownish or greenish-brown, decidedly alkaline, and loaded with dense, ropy mucus.

Fig. 475.



Phosphates.

The triple phosphatic deposit very often alternates with the yellow lithic or calcareous. Old persons are more subject to it than children and adolescents, and it is always associated with great disorder of the digestive organs. The patient is weak, irritable, and bloodless; the slightest exercise fatigues him, and he complains constantly of a dull, heavy, aching pain in the lumbar region. Over-exertion, errors of diet, dyspepsia, severe courses of mercury, and excessive venery, are its most common exciting causes.

b. The *calcareous deposit* is composed of phosphate of lime, and occurs in the form of an impalpable powder, of a whitish, grayish, or drab color. The urine, as in the triple variety, is pale, copious, and of low specific gravity, and is readily decomposed by exposure to the atmosphere. The deposit is often accompanied by an inordinate secretion of mucus.

c. The *mixed deposit*, consisting of a combination of the two preceding, is very common. It is usually combined with mucus, which is often secreted in large quantity, and of a ropy, viscid character. The urine is fetid, pale, and abundant, depositing a thick mortar-like sediment upon standing. The most common causes of this condition are, injury of the lower part of the spine, organic disease of the kidney and bladder, dyspepsia, long-continued bodily fatigue, mental anxiety, night watching, unwholesome food, and debilitating medicines. Patients thus affected are weak, flatulent, irritable, nervous, easily influenced by cold, emaciated, and of a gloomy, desponding disposition. The urine is voided more frequently than in health and with more or less pain and scalding along the urethra. Pain in the loins is seldom wanting.

Carbonate of lime is occasionally found in small quantity in deposits of earthy phosphates, in union with alkaline urine. It generally occurs as an amorphous powder, but now and then in dense, crystallized circular stellæ. Its presence is readily detected with nitric acid, which dissolves it with effervescence.

In the *treatment* of this diathesis, the principal indications are, first, to improve the condition of the digestive organs; secondly, to acidify the urine; and, thirdly, to strengthen the system. To accomplish the first of these objects, it is necessary to regulate the diet, and administer mild aperients. Hard water should be avoided. Exercise should be taken daily in the open air, but it must never be carried so far as to induce fatigue. The skin should be frequently bathed.

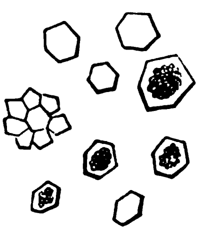
To fulfil the second indication, acids are required, of which the dilute nitric is the best. It may be administered by itself, in a large quantity of water, or, what is generally preferable, in union with hyoscyamus, black drop, paregoric, or infusion of opium. Anodynes can rarely be dispensed with, and are often of immense benefit, from the manner in which they allay pain and nervous irritation. In some instances the tincture of the chloride of iron proves useful. When the urine is rendered preternaturally acid, or when there is marked pyrosis, recourse must be had to soda, or soda and potassa, along with uva ursi and hop-tea. All diuretics, properly so called, are injurious.

The third indication is fulfilled by the use of tonics, such as quinine, bark, and steel, a plain, but generous, diet, exercise in the open air, and change of residence. A sea voyage is sometimes highly beneficial. Exposure to cold, irregularities of diet, and indiscretions of every kind, should be avoided, both during the actual existence of this diathesis, and for a long time afterwards, on account of the great tendency to relapse.

When the deposit depends upon lesion of the spinal cord, the internal use of strychnia and counter-irritation, in the form of blister, issue, or the hot iron, will be of benefit. If inflammation of the bladder or kidney exists, it must be combated by the ordinary means.

4. The *cystine deposit* is very rare; it forms a whitish sediment, consisting of hexagonal crystals of various sizes, impregnated with fatty matter, and often serrated at the edges. It is readily dissolved by the strong mineral acids, as well as by potassa and ammonia, and contains about 26 per cent. of sulphur. The urine which furnishes this sediment emits an odor similar to that of sweet brier, and is commonly found in connection with ill-health, as dyspepsia, imperfect nutrition, and exhaustion of the nervous system. The fluid is sometimes acid, at other times alkaline. The quantity of urea and of uric acid is generally below the normal standard. The bladder is not irritable, nor is there much lumbar pain. Cystine forms the chief ingredient of the cystine calculus. The microscopic characters of this deposit are represented in fig. 476.

Fig. 476.



Cystine.

The chief means for correcting the state of the system upon which this deposit depends are the mineral acids, quinine, nux vomica, gentle exercise in the open air, mental relaxation, cold ablutions, and a generous diet, with a glass of sherry, Madeira, or whiskey at dinner.

STONE IN THE BLADDER.

Most urinary calculi take their rise in the kidneys, from which they descend into the bladder, where, if they are retained for any length of time, they gradually increase in size, and ultimately produce more or less obstruction. When they have a nucleus of uric acid or oxalate of lime, the probability is that they had a renal origin, but vesical if it is phosphatic. Their progress along the ureter has alrerdy been described, and need therefore not detain us here.

The disease occurs at all ages. I have met with several examples of it in very young infants, and cases have been related which render it highly probable that it is occasionally an intra-uterine affection. In my Treatise on the Urinary Organs are given the ages of 6,042 cases of stone in the bladder, as occurring in England, France, and Russia, of which 2,334 were observed from the first to the tenth year, 1,079 from the tenth to the twentieth, 513 from the twentieth to the thirtieth, 353 from the thirtieth to the fortieth, 422 from the fortieth to the fiftieth, 536 from the fiftieth to the sixtieth, 587 from the sixtieth to the seventieth, 201 from the seventieth to the eightieth, and 17 from the eightieth to the ninetieth. Thus, it will be seen that more cases occur prior to the age of twenty than at all other periods together.

In attempting to form a correct estimate of the relative frequency of calculous complaints in children, adults, and old persons, we must not lose sight of the fact that many of the cases which fall into the hands of the surgeon are examples of long standing, extending, perhaps, through a period of many years. Thus, a man at forty may have contracted the disease at ten or fifteen. Moreover, it should be borne in mind that calculous diseases are more frequent, in certain countries, among children than among adults, and conversely.

It is not satisfactorily ascertained whether this affection is ever hereditary. Cases related by Civiale and Prout seem to warrant the inference that it is; but I have myself not met with any confirmatory evidence.

Stone in the bladder is very uncommon in females, owing, mainly, to their having a much shorter and more capacious urethra, which thus favors the excretion of any deposits that might otherwise form in the bladder. It has been alleged that this immunity is due to the fact that women are much less exposed to the exciting causes of the disease than men; but this conclusion is invalidated by the circumstance that at least one-third of all the cases of stone that are met with occur in boys before the tenth year, and, consequently, before they are subjected to any particular hardships.

The different varieties of the negro race of this country are much less subject to calculous diseases than the whites. I have ascertained from reliable statistics, founded upon 443 cases of stone in the bladder occurring in Kentucky, Virginia, Tennessee, Georgia, Alabama, Louisiana, and Missouri, that the latter suffer three times as frequently as the former. The same fact disproves the idea, so much insisted upon by certain writers, that the use of corn bread and bacon, which constitute a large proportion of the daily food of the colored population, in the above regions, is favorable to the production of urinary calculi.

Stone in the bladder occurs in all parts of the world, though by no means with equal frequency. In this country it is more common in Kentucky, Virginia, Tennessee, and Ohio than in any other regions. New England is remarkably exempt from it. The disease is sufficiently common in France, Austria, Hungary, Russia, and England. The inhabitants of Ireland, Spain, and Swizerland, on the contrary, suffer comparatively seldom from it. In Holland, calculus of the bladder is much less frequent now than it was a hundred years ago. The causes of these topographical differences in regard to the occurrence of stone in the bladder have not been determined. The great prevalence of the disease in limestone regions has long been familiar to observers, but whether the use of limestone water has really any agency in its production, is still a mooted question. It is certain that it frequently occurs in freestone regions.

It has long been known that calculous diseases are much more common among the poor than the rich. Upon what this difference depends, is not positively ascertained; the probability is that it is mainly due to derangement of the digestive organs, engendered by the use of unwholesome food, by irregular habits, want of cleanliness, intemperance, and deficient clothing.

Occupation, no doubt, exerts an important influence upon the production of this disorder, but in what manner, or to what extent, is unknown. In Ohio, and the Southwestern States, especially Kentucky, Tennessee, and Alabama, the great majority of calculous subjects are common laborers, farmers, and mechanics, or the sons of persons of this description. Seafaring people are remarkably exempt from urinary calculi, and a similar immunity seems to be enjoyed by soldiers.

Climate, also, exercises no little influence in the formation of urinary concretions. Thus, it is well known that the disease is most common in those parts of the world which are subject to frequent, great, and sudden atmospheric vicissitudes. In very cold and tropical regions it is exceeding rare.

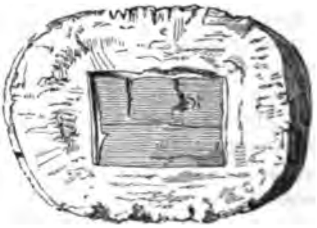
Certain kinds of food predispose to the formation of calculous disease. All articles having a tendency to create acidity and flatulence exert a deleterious influence upon the renal secretion, changing its properties, and promoting the deposition of earthy matter. Hot bread, in its various forms, frequently only half-baked, and generally very imperfectly masticated, is sufficient, if used for any length of time, to wear out the strongest stomach, and break down the most vigorous frame. A weakened digestion, with a sour and flatulent state of the stomach, constipation of the bowels, and an irritable condition of the brain, cannot by any possibility produce a healthy blood, any more than a morbid state of the blood can produce a healthy urine.

Various kinds of drinks exert an influence favorable to the formation of stone in the bladder. It has long been remarked in England that those districts in which cider is much employed are remarkably prone to calculous disorders. On the other hand, it is alleged that the use of Rhenish wine and of gin acts as a preventive.

The formation of stone in the bladder is remarkably favored by certain kinds of diseases, especially stricture of the urethra, chronic enlargement of the prostate gland, and organic affections of the bladder, ureters, and kidneys. Injury of the spinal cord, particularly when it involves the dorso-lumbar portion of that structure, or the nerves detached from it, is extremely prone to be followed by phosphatic deposits; and it has long been known that gout and rheumatism are eminently conducive to the formation of uric acid calculi.

Physical Properties.—Most calculi have a distinct *nucleus*, round which the earthy matter accumulates and crystallizes. The nucleus may be formed of any substance, either solid or semi-solid, whether generated in the urinary organs, or introduced from without. In general, it consists of some saline matter of the urine, as uric acid, oxalate of lime, urate of ammonia, or phosphate of lime and magnesia. Inspissated mucus, lymph, hair, or clotted blood, may serve a similar purpose. In my private collection are specimens in which the concretions were

Fig. 477.



Calculus with a cork for a nucleus.

formed round the tail-bones of a squirrel, an elm bougie, a piece of lead pencil, and a bullet, the latter having been kindly presented to me by Dr. Robinson, of Warfordsbury, Pennsylvania. In fig. 477, from a preparation in the cabinet of Dr. Sabine, of New York, the nucleus consists of a piece of cork. Professor Van Buren informs me that he has a calculus which was formed round an ear of wheat. Finally, the nucleus varies much in size, color, shape, and consistence; and, although generally single, it is sometimes double, triple, and even quadruple, probably from the aggregation of several concretions. In India, according to Dr. Carter, of Calcutta, oxalate of lime forms the nucleus of urinary concretions twice as frequently as in England.

The *number* of concretions is variable. In general, there is only one, but there may be several dozen, if not several hundred. The largest number I have ever found was fifty-four. Dr. Physick, in one case, met with upwards of one thousand, from the size of a partridge shot to that of a bean.

The mulberry calculus is almost always solitary; and the same is true, but not to the same extent, of the uric calculus. The phosphatic calculus, on the contrary, is not unfrequently multiple. When the concretions are numerous, they are generally proportionately small and smooth. When they are solitary, they are rough and comparatively large.

The *volume* of urinary concretions ranges from a hemp-seed to a goose's egg. In young subjects, and in recent cases generally, it is usually inconsiderable. The size of a urinary concretion, however, does not necessarily depend upon the period of its sojourn in the bladder, or the age of the patient. Occasionally, it increases very rapidly, so as to attain a large bulk in a very few months; and, on the other hand, it may remain small for many years.

The ammoniaco-magnesian and the fusible calculi are capable of attaining a very large size, while the uric, oxalic, cystine, xanthic, and fibrinous are almost always comparatively small, no matter what may be their age, or the age of the patient. This fact is interesting in a practical point of view; because, by ascertaining the calculous diathesis of the sufferer, we shall be able to form a tolerably correct idea of the volume of the stone under which he is laboring.

The *weight* of urinary concretions does not, in general, exceed a few drachms or ounces. Many examples, however, are recorded of four, six, eight, ten, twelve, fifteen, and even sixteen ounces. Deschamps gives one of fifty-one ounces.

The *consistence* of vesical concretions, as a general rule, varies from that of semi-concrete mortar, chalk, or wax to that of stone. The hardest calculi are the oxalic and uric, which commonly emit a clear sound when struck with steel, and cannot be fractured without a considerable degree of force. Calculi, on the other hand, composed of ammoniaco-magnesian phosphate and phosphate of lime, are friable, and easily reduced to powder. The cystine and fibrinous calculi are quite soft, the latter scarcely equalling that of yellow wax. In what are termed alternating calculi, one part of the stone will commonly be hard and compact, while another is soft and friable, if not pulverulent.

Stones are occasionally composed of a mixture of sabulous matter and hair. Their formation is of rare occurrence, and they appear to consist, principally, of phosphate of lime and magnesia.

The *color* of these bodies is variable. The cystine and fibrinous calculi are of a yellow hue; the phosphatic, whitish or grayish; the oxalic, dark or blackish; the uric, rose, reddish or brown.

Vesical calculi assume a great variety of *forms*. The circumstances which are chiefly concerned in producing this result are the action of the bladder, the friction which the concretions, when multiple, exert upon each other, and the nature of the nucleus. Finally, it is not unlikely that the chemical constitution exerts more or less influence upon the shape of a stone.

Vesical calculi are generally of an oval form, but they may be round, or even angular, or cylindrical. Sometimes several are matted together, so as to form what, geologically, is termed a pudding-stone. Dr. Mussey showed me, some years ago, a very curious calculus, depicted in fig. 478, which had been removed [illegible] who had long labored under [illegible] and consists of a [illegible] which has a small cavity [illegible]

Fig. 473.

[illegible] several of the [illegible] be [illegible] parts [illegible] in fig. 47[illegible] The [illegible] urinary calculi [illegible] per [illegible]

[illegible] a [illegible] Wat[illegible] surface of the [illegible] internal [illegible]

The [illegible] is a variety of the preceding. It is [illegible] observed [illegible] rare. It is generally of small size [illegible] smooth surface [illegible] and composed of concentric [illegible] present a very [illegible] when fractured. Much more [illegible] water than the [illegible] gives out a strong ammoniacal smell when [illegible] with caustic potassa, and deflagrates remarkably under the blowpipe. Its specific gravity is about 1.475.

Fig. 480.

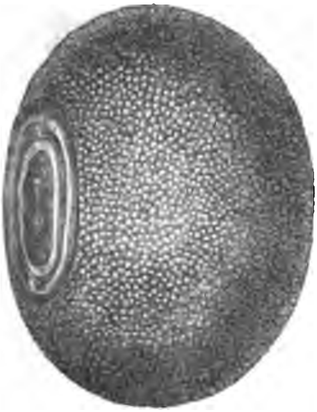
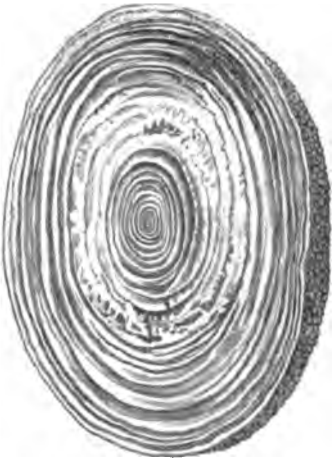


Fig. 481.



Uric calculus.

Next to the uric calculus, in point of frequency, is the *oxalic*, which is generally of a dark brown, olive green, or purplish color, rugged, spinous, or tuberculated on the surface, very hard, compact, and imperfectly laminated, seldom larger than a walnut, spherical, and always single. Under the blowpipe, it expands and effloresces into a white powder, while it dissolves slowly in nitric and hydrochloric acid, provided it be previously well broken up. In the alkalies, it is perfectly insoluble. Its fracture is splintery, and its specific gravity 1.700. It is often called the *mulberry* calculus, from its resemblance to the fruit of the mulberry, and consists essentially of oxalate of lime. Figs. 482 and 483 show the external appearance and internal structure of this concretion.

Fig. 482.

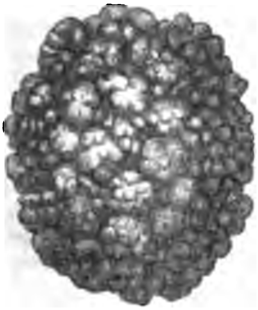
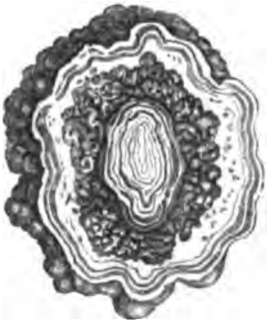


Fig. 483.



Oxalic calculus.

A variety of this species of calculus, seen in fig. 484, has been described by the term *hemp-seed*, from some resemblance which it bears in color and lustre to that substance. It is always of small size, remarkably smooth, and generally exists in considerable numbers, being rarely, if ever, found alone.

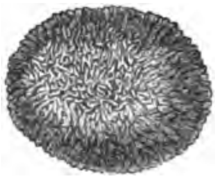
Fig. 484.

Hemp-seed calculus.

Fig. 485.

Phosphatic calculus.

Fig. 486.



Ammoniaco-magnesian calculus.

The *phosphatic calculus*, exhibited in fig. 485, is of a pale brownish color, and of a loosely laminated structure, with a smooth, polished surface, like porcelain. The shape is mostly oval, and the size, though generally small, is sometimes very considerable. It whitens when exposed to the blowpipe, but does not fuse; and readily dissolves in hydrochloric acid, without effervescence. This calculus, composed essentially of phosphate of lime, is extremely rare, as forming entire concretions, but frequently constitutes alternate layers with other matters. It is sometimes called the *bone-earth* calculus, and occasionally contains small quantities of carbonate of lime.

The next species, represented in fig. 486, is the *ammoniaco-magnesian*, so called from its being composed of phosphate of ammonia and magnesia. This mixed calculus is of a white color, friable, and crystallized on the surface, looking a good deal like a mass of chalk, its texture being never laminated; it easily dissolves in dilute acids, but is insoluble in caustic potassa; before the blowpipe, it exhales an ammoniacal odor, and at length melts into a vitreous substance. This species of concretion sometimes attains an immense size.

The *fusible calculus* is a combination of the last two. It is of a white color, extremely brittle, leaves a soft dust on the fingers, and is easily separated into layers; when broken it presents a ragged, uneven surface. It is insoluble in caustic potassa, but gives off ammonia; and, under the blowpipe, it is readily converted into a transparent, pearly-looking glass. This concretion is very common, and sometimes attains a very large size. It is frequently met with as an incrustation of foreign bodies. Its specific gravity is about 1.300. Figs. 487 and 488 exhibit the outer appearance and internal structure of this concretion.

Fig. 487.

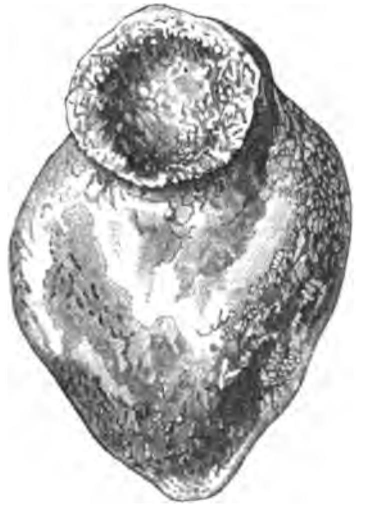
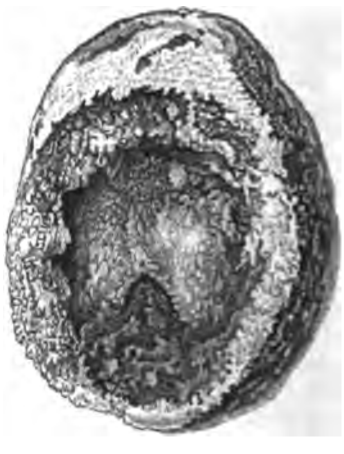


Fig. 488.



Fusible calculus.

The *cystine calculus* is very infrequent, small, tuberculated, of a waxy consistence, and of a greenish or tawny color. It consists of a confused crystallized mass, exhibiting, when fractured, a compact, radiating, lustrous structure. It burns with a faint bluish flame, exhales a strong characteristic odor of sulphuret of carbon under the blowpipe, dissolves easily in acids and alkalies, and is generally of an oblong oval shape. Its external and internal characters are shown in figs. 489 and 490.

Fig. 489.

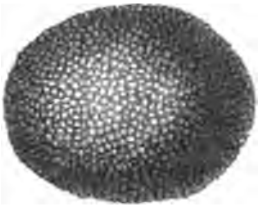
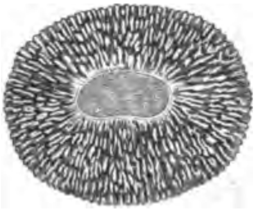


Fig. 490.



Cystine calculus.

The *xanthic calculus* is also extremely rare. Its texture is compact, hard, and laminated, its color cinnamon brown, its surface smooth, its volume small. In a case, however, observed by Langenbeck, a concretion of this kind weighed nearly six drachms and a half. It dissolves very readily in acids and alkalies, and is gradually consumed before the blowpipe, emitting a peculiar fetid odor, splitting into fragments, and leaving a minute quantity of white ashes.

The *fibrinous calculus* is composed principally of the fibrin of the blood, a property to which it owes its name and character. It is of small size, of a spherical or oval shape, and of a brownish color. When dried, it shrinks, and loses some of its weight. It is very infrequent.

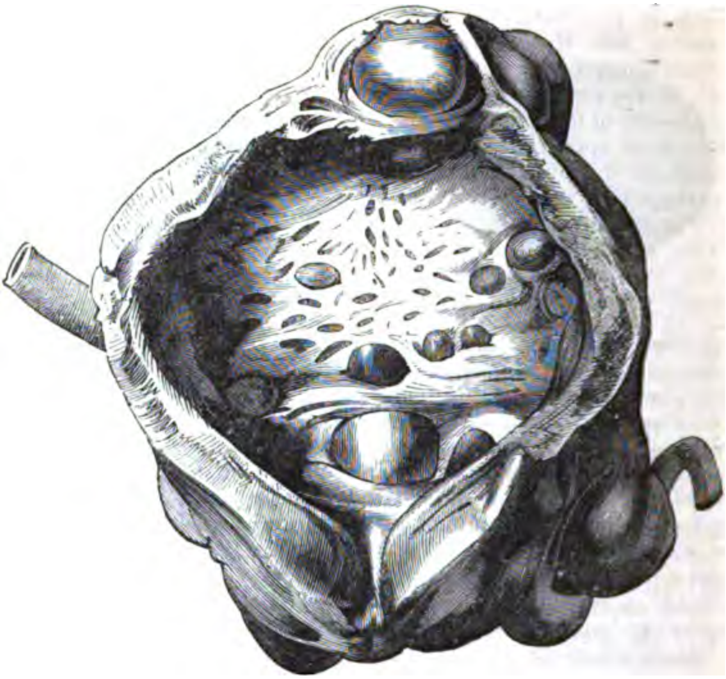
Urostealith, a very uncommon form of concretion, first described by Heller, is of a rounded or oval form, soft, elastic, dark brown, and from the size of a hemp-seed to that of a hazelnut; when dried, it becomes brittle, and assumes a waxy or greenish-yellow appearance. It readily melts under heat, emitting a peculiar pungent odor, similar to that of benzoin, and is promptly dissolved by ether and solutions of caustic potassa, but is insoluble in boiling water. It consists essentially of fatty matter.

Situation.—Calculi lie generally loose within the cavity of the bladder, and are, consequently, liable to shift their position, not only with that of the viscus in which they are contained, but also with that of the body. Hence at one moment they may be at the bas-fond of the organ, at another at the neck, at another at its superior portion or base, at another at its sides, and at another, perhaps, at its anterior part, just above or behind the pubes. A knowledge of this variation in the position of these foreign substances is of no little importance in regard to the operation of sounding. Their most common situation is, undoubtedly, the bas-fond of the bladder, from the fact that this is the most dependent portion of the reservoir. In old subjects, affected with enlargement of the prostate, the concretion generally lies just behind this body, in a sort of pouch, hollow, or cul-de-sac. When this is the case, and the calculus is of large size, it may often be easily felt by the finger in the rectum. When the bladder is perfectly sound, the concretion, especially when the patient is in the erect position, and the urine evacuated, rests against the neck of the organ, and sometimes even projects into the orifice of the urethra.

Cases occur in which the concretion is alternately loose and fixed. This may be owing to the existence of an abnormal pouch. The foreign body may also be arrested in the folds of the mucous membrane, in a depression behind the prostate, in the substance of this gland, in the orifice of the ureter, or in the mouth of the urethra.

Vesical calculi may become permanently *adherent*, attached, or fixed, as exhibited in fig. 491, from a specimen in the cabinet of Dr. Peticolas, of Richmond. This may take place in different ways, and under a variety of circumstances, of which the following may be mentioned as the most important:—1. An effusion of plastic matter. 2. The formation of an abnormal pouch. 3. The existence of a fungous tumor or excrescence. 4. A bilobed state of the bladder. 5. The projection of the concretion into the ureter, or some other passage. 6. Its lodgment in the wall of the bladder.

Fig. 491.



Encysted calculi.

Finally, the calculous matter, instead of being collected into a distinct concretion is sometimes spread out in the form of a *layer* upon the bas-fond of the bladder. A layer of this kind, of considerable thickness, now and then forms around a spongy, erectile, or fibrous tumor of this organ. When the calculous matter presents this peculiar arrangement, it grates under the instrument, and may be distinctly felt through the rectum. When struck with the sound it emits a peculiar noise, not unlike that of a cracked pot. I have seen several specimens in which this lamelliform arrangement coexisted with separate calculi.

Symptoms.—The symptoms of stone in the bladder may conveniently be divided into the rational and physical, or into local and general, as they affect the urinary apparatus or the system at large.

The rational symptoms are:—1. Pain in making water, especially when the last drops are being expelled, felt both in the bladder and the adjacent parts. 2. A sense of weight and uneasiness in the pelvis, anus, and perineum. 3. Frequent micturition. 4. An occasional interruption of the stream of the urine. 5. Pain and itching in the head of the penis, with smarting and pricking sensations in the urethra, particularly at its orifice. 6. Enlargement of the penis and elongation of the prepuce. 7. Occasional priapism, with or without sexual desire. 8. An increased secretion of mucus from the lining membrane of the bladder, not unfrequently mixed with pus. 9. A bloody state of the urine. 10. Incontinence of urine. 11. Prolapse of the anus. 12. Sympathetic suffering. 13. Noise furnished by the calculi knocking against each other in the bladder. These symptoms usually come on gradually, and a considerable period often elapses before the patient is led to suspect the real nature of his condition. This is especially the case when the general health is good, and the bladder perfectly sound.

The constitutional symptoms of urinary calculus are exceedingly variable. In general, however, the suffering is much less than might, at first, be supposed. In children, in particlular, the distress is often entirely of a local character, the system taking little, if any, cognizance of the affection. In a great majority of the children whom I have cut, upwards of fifty in number, the general health was excellent, as was proved by the state of the countenance, appetite, and bowels, and the absence of fever and disorder of the secretions. Very often, indeed, the patient is, to all appearance, perfectly well. His cheeks are rosy, and he is fat and plump, as if nothing ailed him. Occasionally, however, he suffers very much, perhaps at a very early stage of the disease, and the distress goes on progressively increasing until the health is completely wrecked. Adults and elderly subjects are, as a general rule, much less tolerant of urinary calculi than children; the system soon gives way, the appetite and strength decline, and the features are strongly denotive of the vesical disease.

Lesion of the associate organs of course always increases the constitutional suffering. This is particularly true of disease of the kidneys. Whenever these structures are seriously implicated, the general health rapidly declines, and the patient, if not timeously relieved, gradually sinks under his complicated disorders. Disease of the bladder, as ulceration, hypertrophy, or chronic inflammation, never fails to aggravate the constitutional symptoms. Persons of a nervous, irritable temperament suffer more severely than the cold and phlegmatic. The nature of the concretion also exercises an important influence. Oxalic and phosphatic calculi usually cause more distress, both local and general, than any of the other varieties. Large stones, other things being equal, occasion more suffering than small, rough than smooth, multiple than single.

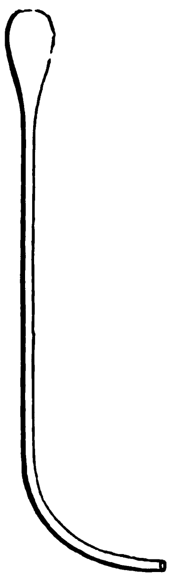
The most important general symptoms are, gradual failure of the health, disorder of the digestive organs, as flatulence, acidity, and irregularity of the bowels, derangement of the secretions, depression of spirits, loss of flesh and strength, and a remarkable susceptibility to atmospheric vicissitudes. The pulse is small, irritable, and abnormally frequent; the extremities are habitually cold; and the skin, dry and husky, exhales a peculiar urinous odor. Now and then, without any assignable cause, or under the effects of treatment, the symptoms, both local and general, temporarily disappear, to return subsequently, perhaps, in an aggravated form.

Physical Signs—Sounding—Diagnosis.—When the symptoms above described are all present, or even when several of them are absent, there is a strong probability that the patient is laboring under stone of the bladder, and this probability is converted into certainty when the surgeon is able to feel and hear the foreign body. Nevertheless, cases occasionally occur, in which, notwithstanding the existence of both rational and physical signs, no concretion is to be discovered.

Sounding consists in introducing into the bladder an instrument shaped like a catheter, either solid or hollow, with which the cavity of the organ is explored. The instrument itself is called a sound.

Sounds vary in their construction, in their size, and in the materials of which they are composed. The best are solid, well polished, and made of steel, with varying degrees of curvature, as in figs. 492 and 493. For an adult, the length from one extremity to the other should be about twelve inches, of which two inches and a half should be allowed for the handle. Children, of course, require a shorter instrument. Generally speaking, a sound of moderate diameter is preferable to one of large size, as it is more easily moved about in the bladder. The vesical extremity or beak should be rounded off, not conical or pointed, so that it may not be arrested by the irregularities of the urethra. The curved portion should not, as a general rule, exceed three inches, and should form an angle of about 45° with the straight portion. The handle of an adult sound should not be less than two inches in length, by one inch and an eighth in width; it should taper somewhat towards the stem of the instrument, be about a line in thickness, rounded off at the corners, and well polished. Every lithotomist should be provided with several sounds, of various sizes and curvatures.

Fig. 492.



Ordinary sound.

A short time before the operation, the bowels should be well cleared out with castor oil, or a purgative enema, in order that there may be no obstruction in the rectum.

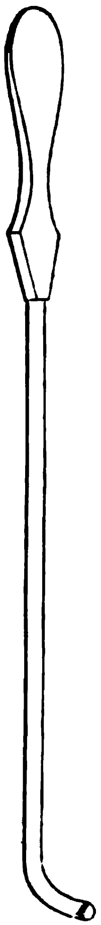
The bladder, at the time of the exploration, should contain from three to five ounces of urine; or, if it is too irritable to retain that quantity, or if the patient has urinated inadvertently, the requisite distension should be produced by the injection of tepid water, through a silver catheter, which may then be used as a sound, care being taken to stop up its orifice, to prevent the regurgitation of the fluid.

During sounding, the patient should lie upon his back, with his head and shoulders somewhat elevated, and the lower extremities slightly flexed and separated, to relax the abdominal muscles. Adults are sometimes sounded in the erect posture; children never, except under particular circumstances. The surgeon comports himself precisely as in catheterism.

Frequently the sound encounters the stone the moment it enters the neck of the bladder; should this not happen, it must be passed further in, and moved about in different directions until the object is accomplished.

The pubic surface of the bladder can be reached only by an instrument with a very long curve, not unlike that of an English S. Very frequently the stone cannot be felt, in consequence of its lying in a pouch, in the bas-fond of the organ, just behind the prostate. When this is the case, the index-finger of the left hand, properly oiled, is introduced into the rectum, and the foreign body pushed forwards against the sound. When the difficulty is very great, an instrument with a short, abrupt curve, as in fig. 493, may be used. Sometimes it is necessary to change the position of the patient, making him lie on his side, sit or stand, bend forwards, or raise his buttocks.

Fig. 493.



Abruptly curved sound.

The crying and struggling of children may be quieted by the use of chloroform, which I am in the habit of employing in nearly all cases of the kind, both for the purpose of preventing pain, calming the patient's mind, and soothing the bladder.

The noise and sensation communicated by sounding are peculiar. The noise is a sort of click, clink, or clear metallic resonance. It is in the highest degree valuable as a diagnostic sign. It may often be perceived at a distance of several yards from the patient. Some surgeons, in order to render it more distinct and satisfactory, attach a flexible stethoscope, or a sounding-board of light, compact wood, to the handle of the instrument; but I have myself never found any need of such an expedient. A grating, rubbing, or friction sensation is sometimes distinguished, but this is rather indicative of a fasciculated state of the bladder, a morbid growth, or an incrusted condition of the mucous membrane than of the existence of stone.

Patients are often brought to the surgeon from a distance to be lithotomized. When this is the case, they should not be sounded until they have recovered from their fatigue; nor should the operation be performed during or immediately after a "fit of the stone." The system should be prepared for the operation. From neglect of this precaution, patients are often subjected to much suffering, and there is no doubt that life has been repeatedly sacrificed in this way.

The sounding should be conducted with the utmost gentleness, and should never be continued beyond a few minutes at a time.

When the stone is very small, or the feel and noise elicited are very feeble, recourse may be had to auscultation. This may be done by applying the stethoscope either to the pubic region, to the sacrum, or to the perineum, while the sound is moved about in the bladder.

Sounding enables us not only to detect the presence of a calculus in the bladder, but it frequently furnishes important data in regard to its bulk, situation, and consistence, and as to whether it is single or multiple, rough or smooth, loose or attached.

Another object in sounding is to ascertain the condition of the urinary apparatus. This can frequently be accomplished in no other manner. The capacity of the organ, and the amount of its sensibility or tolerance may thus be discovered.

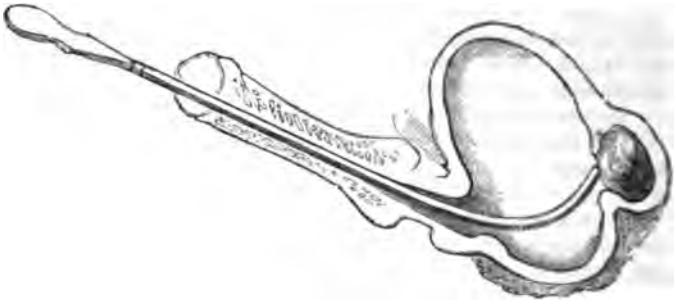
Moreover, we may generally determine, with considerable accuracy, by such a mode of exploration, whether the inner surface of the bladder is smooth or rough, ulcerated or fasciculated, incrusted with lymph or sabulous matter, or studded with fungous, fibrous, or other morbid growths. The passage of the sound along the urethra enables us to judge whether this tube is healthy or diseased, contracted, changed in its direction, or obstructed by the presence of a foreign body. The condition of the prostate gland is best determined by the finger in the bowel. The anus and rectum should also be carefully examined.

Although sounding is the only certain way of detecting the presence of stone, it is by no means free from error, as is proved by the fact that many a poor patient has been subjected to all the pains and penalties of lithotomy, when the bladder was perfectly free from everything of the kind. I am cognizant of at least half a dozen cases in which this mistake was committed. The circumstances which may give rise to it differ very much in their character, some being dependent upon the bladder itself, others upon the neighboring parts, as the prostate gland, rectum, uterus, vagina, and pelvic bones. Mere irritability of the bladder, attended with a frequent desire to void the urine, may lead to the supposition of the existence of stone, and if the surgeon, anxious for the eclat of an operation, should, in such an event, strike his sound against a mass of impacted feces, a projecting sacrum, or a morbid growth in the bladder or pelvis, he would be very apt to deceive himself. The greatest possible circumspection should, therefore, always be used in sounding; the operation, if necessary, being performed again and again, until it is perfectly certain that a stone really exists.

On the other hand, it is well known that there may be a stone in the bladder, and yet the surgeon be unable to detect it by sounding, aided, perhaps, by all the auxiliary means at his command. This failure has frequently occurred even when the concretion has been uncommonly large, and when the operation has been repeatedly performed with the greatest care and skill, as well as varied in every possible manner. Want of success has sometimes attended, even where the calculi were multiple, or where a considerable number coexisted. Again, it has happened that a stone has been promptly detected in a first sounding, and, perhaps, not at all, or only after much trouble, in a subsequent one. Or the reverse of this may occur, that is, the concretion may elude the instrument in a first and second sounding, but be always readily detected afterwards. It is with sounding as with everything else; to perform it well requires great tact in the use of instruments, a perfect knowledge of the anatomy of the urinary apparatus, and a degree of experience which multiplied observation alone can supply. The want of success, however, in this operation, is not confined exclusively to the young, the ignorant, or the unskilful. Men of the most consummate dexterity have occasionally failed in detecting a stone, when a stone really existed.

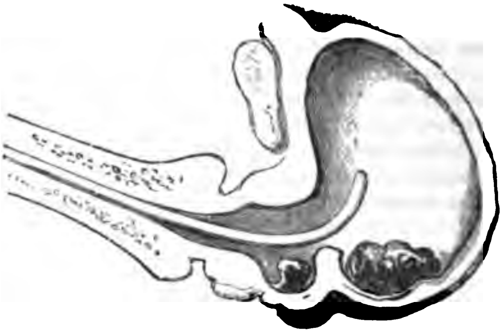
Of the various circumstances which may prevent the detection of urinary calculi, some relate to the stone itself, some to the bladder, and some to the neighboring and associated organs. Thus, the foreign body may be very small, or there may be too much or too little water in the bladder during sounding; or it may be encysted, as in fig. 494, or lodged in a cul-de-sac, at the bas-fond of the bladder, just behind the prostate gland, as in fig. 495. Sometimes, again, the concretion lies in a dilated ureter, or in a pouch in the prostate gland itself.

Fig. 494.



Sounding for stone in sacculated bladder.

Fig. 495.



Sounding for stone in enlarged prostate.

Pathological Effects.—Although the formation of vesical calculus is the immediate result of a morbid condition of the urinary secretion, the bladder and its associate organs are generally diseased, to a greater or less extent, in the progress of the affection. The primary impression is probably always made upon the viscus in which the concretion is confined; but the irritation which its protracted presence there induces is gradually reflected upon the other portions of the apparatus, awakening in them, in the first instance, important sympathetic actions, and, ultimately, serious structural lesions.

One of the first effects to which the foreign body gives rise, is inflammation of the mucous coat of the bladder, as indicated by a frequent desire to make water, spasmodic pains in the lower part of the pelvis, and an increased secretion of mucus. Thickening of the lining membrane with increased vascularity, and the development of granulations, is another effect; and, the irritation extending to the different coats of the bladder, hypertrophy of the organ may take place. A diminution in the size of the bladder is not unusual even in young subjects, but is much more common in old persons, who have labored for years under the continued irritation of a calculus. Ulceration of the mucous coat is another effect of such a body in the bladder. It is most frequently observed at the neck and bas-fond of the organ.

One of the most distressing accidents which take place, during the progress of this disease, is perforation of the bladder, followed by a partial or complete escape of the stone, and the formation of a fistule. When it is accompanied by extravasation of urine into the surrounding cellular tissue, it may terminate fatally in a few days, or lead to violent inflammation and suppuration, inducing death at a more distant period.

The urethra rarely suffers except in its prostatic portion, which may be unnaturally red, inflamed, hypertrophied or attenuated. The prostate gland soon becomes diseased. It gradually increases in volume and density, sometimes enlarging in every direction, impeding the flow of urine, augmenting the pain and spasm of the bladder, and even producing serious pressure upon the rectum. Ulceration, abscess, and sloughing may follow from the constant and excessive irritation. In some instances the prostate is converted into a cavity, nearly equal to that of the contracted bladder itself, and capable of lodging a calculus of considerable size.

The ureters are frequently reddened and thickened, sometimes ulcerated, and now and then enlarged, or enlarged at one place, and contracted at another.

The kidneys rarely entirely escape. In the worst forms of the malady, it is not unusual to see one of them converted into a large pouch filled with purulent matter, or turbid urine.

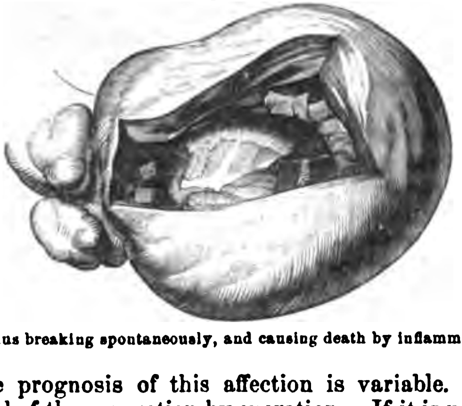
Abscesses and fistules occasionally form in the perineum. Prolapse of the anus may take place, attended with relaxation of the sphincter muscles, inflammation and thickening of the mucous membrane, and hemorrhoidal tumors.

The orifices of the seminal ducts are, in many cases, dilated, or otherwise affected, and the ducts themselves may be variously altered. The seminal vesicles are sometimes atrophied, or diminished in volume and changed in structure.

A calculus of the bladder has sometimes obstructed parturition, and required extraction before the labor could be completed.

Finally, when a number of calculi coexist, some of them may occasionally break spontaneously in the bladder, by striking forcibly against each other, as when the patient is running very fast, or even, perhaps, simply from the violent contraction of the bladder upon its contents. The occurrence, of course, implies extraordinary brittleness of the concretions. The uric or oxalic calculus is not susceptible of such a change, of which a good illustration is afforded in fig. 496.

Fig. 496.



Calculus breaking spontaneously, and causing death by inflammation.

Prognosis.—The prognosis of this affection is variable. The only reliable treatment is removal of the concretion by operation. If it is permitted to remain, it generally steadily increases in bulk, and ultimately leads to serious organic disease of the bladder, prostate gland, ureters and kidneys, which causes not only a great deal of suffering, but imperils life by its long-continuance, the patient being finally worn out by hectic irritation. The period at which death occurs ranges from eighteen months to ten, fifteen, twenty, and even thirty years.

TREATMENT OF STONE IN THE BLADDER.

A small calculus is sometimes extruded spontaneously, especially when the bladder, crowded with urine, contracts upon its contents with unusual vigor. Such an event is, of course, much more likely to happen in the female than in the male, owing to the difference in the length and dilatability of the [illegible] Cases have occurred, though very rarely, in which riddance was [illegible] ulceration of the bladder, the concretion passing off by the rectum, [illegible] neum or hypogastrium.

Spontaneous fracture of a stone in the bladder is always fraught with [illegible] as the fragments, by their jagged edges and rough surfaces, must inevitably [illegible] severe irritation, speedily followed by violent cystitis and death. In [illegible] the patient perishes from peritonitis, or, if he survives the immediate [illegible] the accident, the bladder may give way by ulceration, and he may [illegible] from extravasation of urine. Occasionally a sharp irregular fragment [illegible] pelled into the urethra, causing retention of urine, or the obstruction [illegible] produced by the presence of coagulated blood, poured out by the [illegible] irritated bladder.

When a calculus breaks spontaneously in the bladder, no time should be [illegible] in idle attempts at palliation; the only effectual remedy is lithotomy, [illegible] sooner this is performed the more likely will the patient be to do well. [illegible] operation should be resorted to even when there are already well mark[illegible] dences of cystitis, although the chances of recovery will then be propor[illegible] less.

The treatment of stone in the bladder necessarily divides itself into [illegible] and surgical, of which the former is, in general, merely palliative, [illegible] quently of paramount importance, whether it be considered only in refer[illegible] the temporary comfort of the sufferer, or as a means of improving his [illegible] with a view to his relief by an operation.

1. MEDICAL MEANS.

Persons affected with stone in the bladder do not always find it conveni[illegible] submit to the operation of lithotomy, and it, therefore, becomes a matter of [illegible] importance to render them as comfortable as their circumstances may [illegible] By attention to the general health, as regulated by food, drink, and ex[illegible] much may be done to allay local suffering, and to make the patient almost [illegible] his disease. A concretion, which may have been a source of great distress [illegible] years, may, by appropriate and well-directed treatment, become a compara[illegible] harmless tenant of the bladder, and thus convert a state of torture into [illegible] Elysium. The improvement thus produced has sometimes lasted many [illegible] though, in general, it is comparatively short. A consideration of these cir[illegible] stances has led to a belief, not altogether unfounded, that urinary [illegible] are sometimes dissolved in the bladder, and voided along with the urine. He[illegible] certain remedies, supposed to be endowed with this property, have received [illegible] name of lithontriptics or solvents and disintegrators of stone. Much of [illegible] might be said under this head has been anticipated in the article on the di[illegible] calculous deposits.

It is hardly necessary to remark that a due regulation of the *diet* is of [illegible] mount importance in the treatment of stone in the bladder. Without enter[illegible] into details, it may be observed, in general terms, that the diet should be [illegible] easy of digestion, and yet sufficiently nutritious. Plainly roasted meats, [illegible] fish, mealy Irish and dry sweet potatoes, well boiled rice and hominy, soda [illegible] cuit, and stale wheat bread, with weak tea, or milk and water, are, ordinar[illegible] the most suitable articles. Coffee, wine, fermented liquors, cider, and [illegible] fruits, with pastry, and the coarser kinds of vegetables, are to be eschewed. [illegible] the patient is feeble, or has been in the habit of employing liquor, a little Fr[illegible] brandy, or, what is better, Holland gin, may be allowed at dinner and a[illegible] exercise. Gin has a specific tendency to the urinary organs, and its [illegible] occasionally attended with good effects. Some persons are greatly benef[illegible] by hop-tea, beer, or malt liquors. Generally speaking, however, these ar[illegible] produce more harm than good. All kinds of water impregnated with lime [illegible] be abstained from. The patient should be well clad, avoid exposure to wet and cold, and refrain from rough exercise of every description. In the winter, [illegible] should keep himself well housed, or reside, if possible, in a warm and genial climate. Sexual excitement must be carefully guarded against, for any indulgence of the kind is always sure to be followed by an aggravation of the complaint.

The urine must, in all cases, be kept in as neutral a condition as possible. If it be acid, alkalies are indicated; if alkaline, acids. Frequent examinations of the fluid are, therefore, necessary, in order that the remedies may be varied as the circumstances of each particular case may render it proper. It is worthy of remark that some patients are most benefited by alkalies, others by acids, even when the urine and the stone are both apparently of the same character. In my own practice, I have generally derived most benefit from the use of alkaline remedies, whatever may have been the nature of the diathesis, or of the concretion.

The best alkalies in the treatment of vesical calculi are soda and potassa, in the form of bicarbonate, either alone, or variously combined with each other. I usually give the preference to the soda, for the reason that it seems to me to exert a more obtunding effect upon the mucous surfaces of the urinary passages. The best form of exhibition is a solution in a strong infusion of hops and uva ursi, in the proportion of thirty grains to the ounce, three or four times a day. The best period for using the medicine is about one hour after meals and at bedtime. Administered in this way it readily mixes with the ingesta, prevents the evolution of acidity and flatulence, and exerts a more controlling influence over the urinary secretion. The quantity of the salt may be gradually increased to forty, fifty, and even sixty grains, according to the tolerance of the stomach; and a good plan is to pretermit the use of it occasionally for a few days. Carbonate of potassa is sometimes employed alone, but its beneficial influence is always greatly enhanced by giving it in union with soda. The liquor potassæ now and then answers an excellent purpose in these cases, particularly in persons of a dyspeptic habit. It should be administered, largely diluted with water, in doses varying from twenty to forty drops, three times daily, or, what is better, under such circumstances, in combination with some of the simple bitters, as tincture of gentian, quassia, or cinchona. Some patients derive much relief from the free use of lime-water, castile soap, magnesia, and lye.

Marked benefit, sometimes of a permanent character, springs from the long-continued use of certain mineral waters. Of the various waters celebrated for their virtue of solving calculi and soothing the bladder, those of Vichy, in France, are the most remarkable, on account of the numerous cases that have been relieved by their employment. The Vichy waters contain a large quantity of free carbonic acid, and very nearly a drachm and a half of bicarbonate of soda in every thousand drachms of the menstruum, upon the presence of which their good effects, no doubt, depend.

When the urine is decidedly alkaline in its character, acids are indicated. Those usually employed are the nitric and hydrochloric, of which the former is preferable. The best form of exhibition is the dilute nitric acid of the shops, in doses of from twenty to thirty drops, three times daily, in nearly half a tumblerful of cold water, sweetened with a little sugar.

Attempts have been made, from time to time, to dissolve urinary calculi in the bladder by means of injections of acid and other fluids, but the results have not been such as to encourage a repetition of the operation, now that the subject is so well understood. The same remark is true in regard to the effects of galvanic electricity, proposed by some French surgeon.

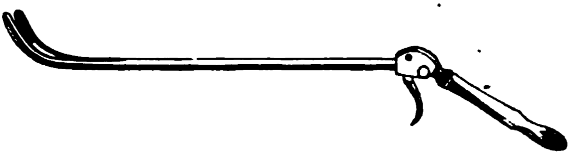
2. EXTRACTION OF CALCULI THROUGH THE URETHRA.

The fact that small calculi sometimes escape during micturition was long ago noticed by practitioners, and has been turned to good account by modern surgeons. When it is known, for example, that a concretion has recently descended from the kidney, its expulsion from the bladder may occasionally be effected by making the patient grasp the head of the penis, while he distends the urethra with urine; then, letting go his hold, he empties his bladder with all the force he can direct upon it by the action of the diaphragm and abdominal muscles. The water should be previously accumulated to the greatest possible extent, and, during its evacuation, the patient should lie upon his belly, or bend his body forward, to place the stone in the most favorable position for reaching the urethra. These attempts at extrusion are much facilitated by the prior dilatation of the tube by means of the bougie or catheter.

Efforts have been made, especially in recent times, to remove calculi entire from the bladder, through the urethra, by means of forceps. It was observed, long ago, that, during catheterism, small concretions became occasionally impacted in the eyelets of the instrument, which they followed upon its withdrawal. A circumstance so interesting and important was well calculated to arrest the attention of surgeons, and we accordingly find that they have taken full advantage of it. It was in this way that the late Mr. George Bell, of Edinburgh, had the good fortune to rid a patient of one hundred and fifty concretions. In performing such an operation, a full-sized catheter, with two large eyelets, should be selected, and the bladder should be previously distended with water, so that, as the fluid runs off, the calculi may have a better chance of being forced into the tube.

Instruments have been constructed for the special purpose of seizing the stone, and removing it entire. Sanctorius, if not the first, was one of the earliest surgeons who busied themselves in this manner. He has described the operation with some minuteness, and has figured a pair of forceps which he contrived for performing it. Hales, Hunter and others also invented instruments which have been greatly improved in modern times by Sir Astley Cooper, and some of the French lithotomists. The forceps of the English surgeon, which are represented in fig. 497, and with which he extracted upwards of eighty small calculi from one individual, consist of two movable blades, shaped, when closed, like a curved catheter. They are introduced in the ordinary manner, and are used at first as a searcher. When the stone is found, the blades are gently separated and expanded over it, when, being again shut, the instrument is carefully withdrawn. An index upon the surface of the instrument serves to show the size of the calculus, or, what is the same thing, the possibility of removing it entire. When the concretion cannot be extracted in this manner, it may, if not too hard or large, be crushed, and disposed of piecemeal.

Fig. 497.



Cooper's stone forceps.

In performing this operation, it is important that the bladder should be perfectly free from irritation, that the urethra be previously dilated by the catheter or bougie, and that the forceps do not pinch the mucous membrane. If these precautions are neglected, serious mischief may follow. At least one instance is on record where death ensued, although the operation was executed by a competent surgeon, and the forceps were introduced only twice.

A small calculus has sometimes been entrapped and removed by a very simple procedure. Many years ago, an American practitioner, Dr. Calvin Conant, relieved a youth, aged fifteen, by means of a silver wire, passed through a catheter, the vesical extremity of which was pierced by two holes, about a line and a half apart. The wire, which was very fine, elastic, and twenty inches long, was formed, upon its arrival in the bladder, into a loop, which was then moved about until the concretion was found and ensnared; the ends were next secured to the shoulders of the catheter, when both the instrument and stone were withdrawn.

3. LITHOTRIPSY.

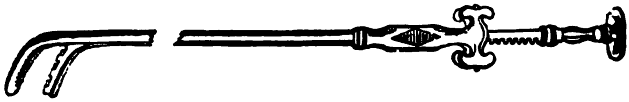
It is not my intention in this place to enter into the history of lithotripsy, or an account of the different steps by which, from humble and unsatisfactory beginnings, the operation has attained its present extraordinary degree of perfection. To Civiale is, undoubtedly, due the credit of the invention, which threatened, at one time, to supersede lithotomy, and struck terror into the minds of the knivesmen. His first successful operation was performed in 1824, at two sittings.

The procedure, as originally executed by Civiale and others, was denominated lithotrity, as it consisted in seizing, boring, perforating, or piercing the calculus. This name is still retained by him, and likewise by some of the English surgeons, although the operation has been essentially modified. As performed at the present day, at least by most practitioners, it consists in breaking, crushing, or grinding the foreign body, and is, therefore, more appropriately termed lithotripsy.

Instruments.—The instrument employed by Civiale, in his earlier operations, was a silver canula, containing a steel tube, furnished with three branches, claws or pincers. Within the steel tube, again, was a cylindrical rod, called the perforator, one end of which was fastened into a sort of crown with sharp teeth, to bore and break the stone into fragments. The perforator was moved during the operation by a steel drill bow.

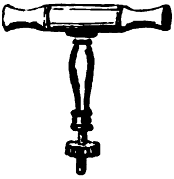
Although great improvements have been effected in this instrument, there are comparatively few surgeons who do not now altogether prefer the operation of lithotripsy, not only because it is equally efficient, but because it is much more simple and easy of execution. The merit of the discovery of this operation is usually, at least in this country, ascribed to Baron Heurteloup, of Paris; but there is no doubt that much credit is also due to Mr. Weiss, the celebrated London cutler. As early as 1824, this gentleman contrived an instrument for this purpose; which, after having been variously modified by different lithotriptists, among others by Mr. L'Estrange, of Dublin, and by Heurteloup himself, was subsequently remodelled and greatly improved by the inventor. The instrument, as now constructed, is remarkable for its simplicity, its strength, and its adaptation to the end proposed. It is composed of two blades, as seen in fig. 498, curved at the extremity at an angle of about 55 degrees, twelve inches in length,

Fig. 498.



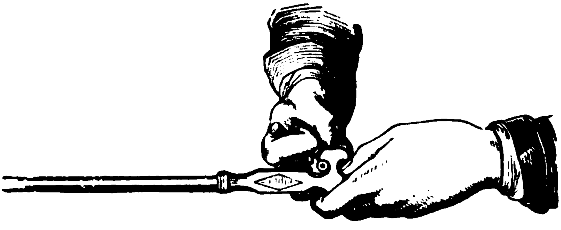
Heurteloup's instrument.

Fig. 499.



Screw of the lithotriptor.

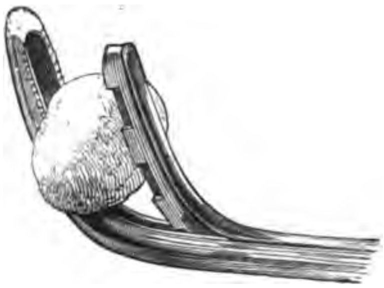
Fig. 500.



Mode of turning the screw.

and about the size of an ordinary catheter; the one sliding within the other, and propelled by means of a screw. Near the upper end of the male rod, is a graduated scale, intended to indicate the size of the stone. The extremities of the beak, on their inside, are serrated or notched, the better to seize, retain, and crush the concretion. The curved portion of the fixed blade is hollow, to prevent impaction of the fragments. Fig. 499 represents the screw or handle, by turning which, in the manner indicated in fig. 500, the male blade is propelled onwards, by short and sudden, but gentle, jerks, so as to imitate slight percussions, until the concretion is shattered. Fig. 501 exhibits the calculus in the jaws of the instrument, and fig. 502 the instrument in the bladder, the stone being grasped in a position suitable for crushing.

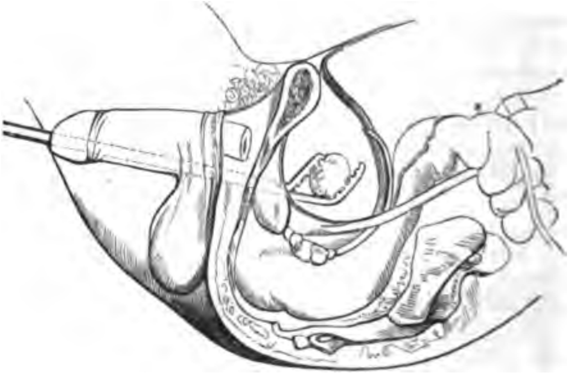
Fig. 501.



Lithotriptor grasping the stone.

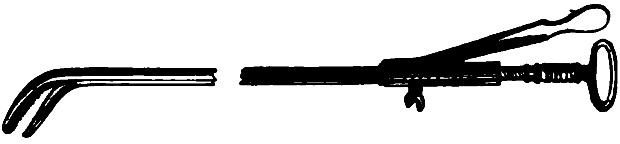
Every operator should be provided with a number of these instruments, of different forms and sizes, that he may be able, without difficulty, to adapt them to the varying circumstances of his patients. When the concretion is small, or uncommonly soft, the lithotriptor sketched at fig. 503 will generally be found to answer every purpose, as it is of simple construction, very light, and of easy management. For the removal of little fragments, or diminutive calculi, an instrument with a short, broad, and rather abrupt curve, the female blade of which is moulded into a kind of cup, to receive and retain the detritus, may advantageously be used.

Fig. 502.



Seizure of the stone in the bladder.

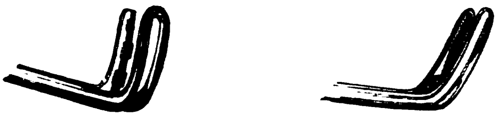
Fig. 503.



Another form of lithotriptor.

In the ordinary lithotriptor, the female blade has a large fissure, to allow the fragments, in the act of crushing, to fall away into the bladder, and thus enable the operator to withdraw the instrument without the risk of lacerating the lining membrane of the urethra. These features are well illustrated in figs. 504 and 505.

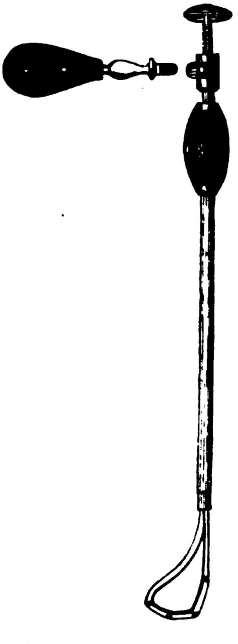
Fig. 504. Fig. 505.



Lithotriptic instruments.

Another meritorious instrument is that of Dr. Jacobson, of Copenhagen. It consists of a silver canula, almost ten inches long, by three lines in diameter, the upper extremity of which is furnished with a circular steel rim, an inch in width, while the lower is slightly curved for about two inches, and terminates in a blunt point. Within this tube is a steel rod, designed to move backwards and forwards at pleasure, and connected inferiorly with the one just described, by means of an articulated chain with three links. The superior extremity projects beyond the horizontal rim of the canula, and is furnished with a stout screw, which is intended to work the chain backwards and forwards, during the seizure and comminution of the stone. A graduated scale exists upon the instrument for measuring the volume of the stone. Fig. 506 represents Jacobson's crusher as modified by Velpeau.

Fig. 506.



Jacobson's lithotriptor.

In addition to the above instruments, the operator should be provided with a large syringe, fitted with rings, and in good working order, the nozzle being small and easily adapted to a silver catheter. When there is serious hypertrophy of the prostate gland, it may be well also to have at hand Crampton's apparatus, consisting of a gum-elastic bottle and a catheter, the former being furnished with a stop-cock. The catheter being introduced into the bladder, and the air exhausted from the bottle, the urine and grit are forcibly expelled by the pressure of the atmosphere.

Selection of Cases for Operation.—A proper selection of cases is a matter of great importance in this operation, for it is not every calculus that admits of being crushed. The circumstances which are favorable to the operation are chiefly a sound condition of the genito-urinary organs, the existence of a small and comparatively soft calculus, and a good state of the general health. There must be no stricture of the urethra, enlargement of the prostate gland, or disease of the bladder, ureters, or kidneys. Even an excess of morbid sensibility of the urinary passages is incompatible with the operation. The stone should be small, soft, and loose. A large concretion cannot easily be grasped and retained by the instrument; a very hard one would be crushed with difficulty, and an adherent or encysted one could not be seized. The mulberry calculus is generally so firm and dense as to resist any amount of pressure that may be safely employed against it; and the uric acid concretion is frequently so large as to render it impossible to seize it. The operation is also inadmissible when there are a number of calculi.

Preparatory Treatment.—Before operating, the system and the parts more immediately concerned should be subjected to a proper course of treatment. If the general health is good, and the bladder is laboring merely under the mechanical inconvenience produced by the stone, little, if anything, will be required beyond a few doses of aperient medicine, rest in the recumbent posture for five or six days, light diet, and the free use of diluent drinks. Should the reverse be the case, a more thorough preparation must be instituted. Under such circumstances, in addition to the ordinary means adverted to, it may be necessary to take blood from the arm, or by leeches from the perineum and the hypogastric region, especially if the patient is young and robust, and to employ the warm bath, bicarbonate of soda with hop and uva ursi tea, and anodynes by the rectum.

The next step is to dilate the urethra. This usually requires but a few days, and is best accomplished with a series of silver catheters, used two or three times in the twenty-four hours.

Chloroform ought generally to be avoided, except in children, as the operation is not attended with much pain. The patient's mind should be clear, in order that he may promptly inform the surgeon of any suffering that may arise.

Operation.—During the operation, the patient may lie on his back, near the edge of the bed, or he may sit in an easy chair with a movable back, as may be most convenient. If he is recumbent, the head and shoulders should be moderately elevated, the breech raised by a pillow, and the thighs separated and held up by assistants. If the meatus is unusually small, as it often is in very young children, it should be enlarged with the bistoury, as this will afford more room for the requisite manipulation. The bladder should contain from six to eight ounces of urine, or a suitable quantity of tepid water should be gently injected through a silver catheter. The lithotriptor, warmed and well oiled, is now carried into the bladder, in the same manner as a common catheter. Upon reaching the organ, the stone, if not felt, is to be searched for. The instrument is next planted against the inferior wall of the bladder, the sliding blade is carefully retracted, and then, by a wriggling movement of the wrist, or a sort of sleight of hand, the concretion is engaged in the jaws of the forceps, which are at once closed upon it. Satisfying himself that the lithotriptor does not embrace the mucous membrane, as he may by moving its point from side to side, or turning it round, he holds it as firmly and steadily as possible with his left hand, while with the other he propels the screw at the handle of the instrument, thus slowly crushing the calculus. If the concretion is small and friable, one effort of this kind will probably be sufficient; but, in general, several will be necessary before this object is fully attained; for even if the foreign body has been pretty thoroughly broken in the first instance, there are almost always some coarse fragments, which require separate seizure and grinding before they can be expelled.

The stone being broken, and a portion of it, if possible, comminuted, the instrument is closed and withdrawn, care being taken that no large fragments remain impacted in its jaws, lest serious injury be thereby inflicted upon the urinary passages. The patient should now be desired to void his urine, which will usually be found to be a little bloody, in order to afford an opportunity to the smaller fragments to escape, the passage of any that remain behind being favored immediately after by injecting the bladder freely and repeatedly with tepid water, through a short, large-eyed catheter. The operation, however, should be performed with all possible gentleness, and should be desisted from the moment it becomes a source of pain or marked uneasiness. The patient is now put to bed, and kept upon light diet, using, however, large quantities of diluent drinks, as gum Arabic water, or linseed tea.

If much pain or spasm ensue, with a frequent desire to empty the bladder, a large anodyne is given by the mouth or rectum, recourse is had to the warm bath, and medicated fomentations are applied to the abdomen and the perineum. Retention of urine is relieved with the catheter. If peritonitis threaten, the antiphlogistic treatment must be carried to its fullest extent, aided by the liberal use of opium.

If no untoward symptoms arise, the operation may be repeated in five or six days. To make sure that the bladder is thoroughly free of foreign matter, frequent recourse must be had to the sound, for the smallest remaining particle will certainly become the nucleus of a new concretion.

The length of each sitting should generally not exceed six, eight, or ten minutes; when the operation is productive of pain, it should be much shorter. It is a safe rule to be governed by the feelings of the patient. The greatest care should be taken not to move the instrument too freely over the surface of the bladder, especially after the calculus has been seized, otherwise it may occasion not only severe distress but violent inflammation.

Ill Effects.—The ill effects of this operation are—1. Hemorrhage. 2. Rigors and fever. 3. Retention of urine. 4. Contusion and laceration of the prostate and urethra. 5. Cystitis. 6. Perforation of the bladder. 7. Impaction of the fragments of the stone in the urethra. 8. Peritonitis. 9. Purulent infection. 10. Atony of the bladder. 11. Renal irritation. 12. Orchitis. 13. Bending and fracture of the lithotriptor. Some of these accidents are unimportant, others serious, if not fatal. Hemorrhage, rigors, retention of urine, cystitis, and prostatitis, should be treated upon general principles.

Perforation of the bladder, although uncommon, has sometimes happened in the hands of the most skilful operators. The accident, which is a most serious one, may be caused either by the instrument itself, or by a fragment of the calculus, a sharp corner of which may perhaps be pressed into the coats of the bladder as the lithotriptor is withdrawn. However induced, the lesion is generally rapidly followed by infiltration of urine and death.

A *fragment* of the broken calculus may be arrested in the urethra, and, if sharp and angular, serious mischief may ensue. If it is situated far back, an attempt should be made to push it into the bladder; but, if it has advanced considerably forward, it may be removed with the forceps.

Purulent infection occasionally occurs, chiefly in old, enfeebled subjects. It is usually very stealthy in its character, and is nearly always fatal. Our principal reliance must be upon mercury and opium, with tonics and stimulants, and free incisions to give vent to effused and pent-up fluids.

Atony of the bladder, as an effect of lithotripsy, occurs chiefly in old subjects, from rude and protracted efforts at crushing. The irritation thus occasioned rapidly extends to the muscular fibres of the organ, which, crippled, if not completely paralyzed, is unable to expel either the urine or the fragments of stone, the retention of which thus becomes an additional source of suffering, both to the part and system, the great danger being from cystitis, accompanied with a low form of fever and excessive prostration.

The proper remedy for this affection is riddance of the fragments. Sometimes this may be effected with the lithotriptor, aided by the injection of large quantities of water by means of a large-eyed catheter. When these efforts fail, relief must be sought by lithotomy.

Renal irritation, followed by suppression of urine, is a rare, but commonly a fatal, accident after lithotripsy. It is most frequent in elderly, irritable persons, and is characterized by pain in the back, a quick, frequent pulse, intense thirst, and other evidences of prostration, along with typhomania. The treatment must be supporting, the chief remedies being quinine, opium, and milk punch, with cupping of the loins, and the use of the warm bath.

Orchitis, as a consequence of lithotripsy, is uncommon; it is most liable to follow upon injury to the neck of the bladder and prostate gland, within a few days after the accident, and is to be treated upon ordinary antiphlogistic principles.

Fracture of the lithotriptor has occurred, but for such an accident both the surgeon and his cutler should be held personally responsible. Should one of the blades of the instrument be retained in the bladder, an attempt should be made to extract it with the forceps; this failing, the organ should be opened through the perineum.

Statistics.—No statistics of this operation on a large scale have hitherto been published. Of 206 cases, furnished, many years ago, by Civiale, 108 were cured, 80 died, and 18 were unrelieved. Malgaigne estimates the mortality from lithotripsy, in the Parisian hospitals, at 1 in 4, while that of private practice, in the French metropolis, is as 1 in 8. In the London hospitals, the operation has not, according to Mr. Erichsen, been a successful one. In 1856, Dr. Ivanchich, of

Vienna, published the particulars of 100 cases of this operation, of which 13 died, and 87 recovered; 81 completely and 6 incompletely. Three of the patients were females. Dr. Swalin, of Stockholm, has lost 7 out of 49 cases. Brodie performed the operation upon 115 cases—not, however, upon so many different patients—of which 106 recovered, and 9 died. Of 133 cases, in 122 individuals, in the hands of Professor Porta, of Pavia, 24 proved fatal, 45 failed, 8 were abandoned, and 13 were lithotomized. Of the fatal cases, 9 were lost in consequence of intercurrent diseases.

It is impossible, in the existing state of the science, to form anything like a correct estimate of the comparative value of lithotripsy and lithotomy. Excepting in France, crushing is so rarely performed that no means for instituting such an estimate have yet been furnished; and, in that country, the only elaborate data are those supplied by Civiale. From these, it appears that relapse followed in 55 cases out of 548, being in the proportion of nearly 1 to 10. This is unquestionably much greater than in lithotomy, and affords a strong argument against the general introduction of the operation, even in the most favorable cases.

The frequent relapse after lithotripsy is no doubt due to the fact that fragments of the broken stone are so liable to be left in the bladder, which thus become, often in a very short time, the nuclei of new formations. In lithotomy, on the contrary, the concretion is generally removed whole, while any pieces that may be split off are either extracted at the time, or they are washed away subsequently by the urine as it flows through the wound, the patency of which, for a certain time, greatly favors this mode of clearance.

The results of lithotripsy, like those of lithotomy, vary, no doubt, materially in the hands of different operators, according to the manner in which they select their subjects, the mode and skill with which they execute their manipulations, and the attention which they bestow upon the after-treatment. There is every reason, too, to believe that the mortality is much greater in hospital than in private practice. All things considered, the conclusion is inevitable that the procedure, in its aggregate results, is decidedly less safe and satisfactory than lithotomy.

4. LITHOTOMY.

Lithotomy may be performed at any period of life, even in early infancy. Experience, however, has shown that the greatest number of recoveries takes place in children and in elderly subjects. Young adults and middle-aged persons are more prone to suffer from inflammation of the urinary apparatus, and perhaps, also, from erysipelas of the wound, and phlebitis of the neck of the bladder and prostate gland.

When a patient is about to undergo lithotomy, he should be subjected to a certain degree of preparatory treatment, in order to place him in the best possible condition to bear the shock and other ill effects of the operation. There is no doubt that much of our success depends upon the manner in which this is done. When the patient is in good health, he will seldom require anything more than a dose or two of aperient medicine, and abstinence from animal food, with rest in his room. Four or five days will, in fact, generally suffice to put him in a proper condition for the operation. But it is very different when he is in bad health; for then a more thorough course of preparatory measures is necessary. The secretions must be rectified, the bowels must be opened by mercurial and other cathartics, the diet must be regulated, and, in a word, all sources of excitement, local and constitutional, must be removed. Too much preparation, however, must be avoided. All serious lesions of the lungs, kidneys, ureters, bladder, and prostate, or, in short, of any other of the more important viscera, forbid interference.

Lateral Operation.—Of the different operations for stone, the lateral, perineal, or infra-pubic, as it has been variously termed, is by far the most important, not only on account of its greater frequency, but also of the remarkable success which has hitherto attended it. In the description which I am about to give, I shall speak of it as I am myself in the habit of executing it, premising that this does not differ, in any essential particular, from the method devised and so happily practised by Cheselden and his disciples.

The design of the lateral operation is to make an opening on the left side of the perineum, extending from the surface of the skin through the neck of the bladder and the prostate gland, and large enough to admit of the easy extraction of the foreign body. It is usually described as consisting of three steps or stages. In the first, the surgeon divides the skin, the cellulo-adipose tissue, and the superficial fascia; in the second, the transverse muscle, the triangular ligament, and the membranous portion of the urethra; and in the third and last, the prostate gland and the neck of the bladder.

The wound made in the operation may be said to represent a truncated cone, the apex of which corresponds with the neck of the bladder, and the base with the surface of the perineum. In the adult, its extent externally varies from three inches to three inches and a half, while internally it does not, as a general rule, exceed fifteen or eighteen lines. Its superior angle is an inch and a quarter above the verge of the anus, and immediately on the left side of the raphé of the perineum; the inferior, on the contrary, is usually about three-quarters of an inch to an inch below the anus, and a little nearer to the tuberosity of the ischium than to the outlet in question. The inner wall of the wound corresponds with the middle line of the perineum; the external with the ramus of the ischium and the erector muscle of the penis.

The evening before the operation, a brisk purgative is administered, to clear out the alimentary canal. The article which I usually select for this purpose is castor oil; but if there is disorder of the secretions, as indicated by the state of the tongue and stomach, a combination of calomel and rhubarb, with a few grains of jalap, is to be preferred. If it appears probable that the rectum has not been thoroughly evacuated, a stimulating enema, consisting of tepid salt water, is used a few hours before the operation.

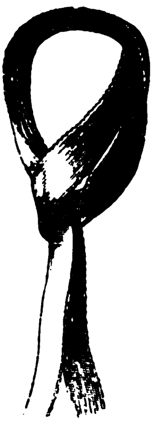
I consider it of paramount importance, both as it respects the safety of the lower bowel, and the comfort of the surgeon, that this precept should be faithfully attended to in all cases. Moreover, by opening the bowel freely, immediately before the operation, there will be no necessity, as a general rule, for any purgative medicine for some days after.

The patient is requested to retain his urine for several hours before the operation, for a certain degree of distension of the bladder is necessary to prevent injury of its walls, and facilitate the extraction of the foreign body. If he is a child, and cannot hold his water without great difficulty, a piece of tape should be tied loosely round the penis, otherwise he will be sure to disobey an injunction which every lithotomist must regard as of no little consequence. In old subjects, affected with excessive irritability of the bladder, and with a constant desire to micturate, it is necessary to inject the organ with a few ounces of tepid water just before commencing the operation.

During the operation the patient lies upon his back, on a narrow breakfast table, about four feet in length, and provided with stout, firm legs, to prevent it from shaking. It is covered with a folded blanket, over which are spread, first, a piece of soft oil-cloth, and, next, a folded sheet. Several pillows are required for the head and shoulders, which, however, should be but slightly raised, otherwise the abdomen will be doubled up, and thus unduly compress the bladder. The breech is fully exposed to the operator, and is, therefore, brought low down, a little over the edge of the table. His head and trunk are held by assistants, one of whom administers chloroform.

If an anæsthetic is used, there will be no necessity for tying the hands and feet; otherwise they should be secured by two stout worsted bands, from six to eight feet in length by two inches and a half in width, with a hole in the middle to afford greater security against their slipping; or they may be arranged as in fig. 507. As a preliminary step, the patient, stripped to his shirt, and placed upon the table, is desired to grasp his feet in such a manner as to apply his fingers to the sole and the thumb to the instep; in which position they are confined by means of the fillets, passed round them in the form of the figure 8,

Fig. 507.

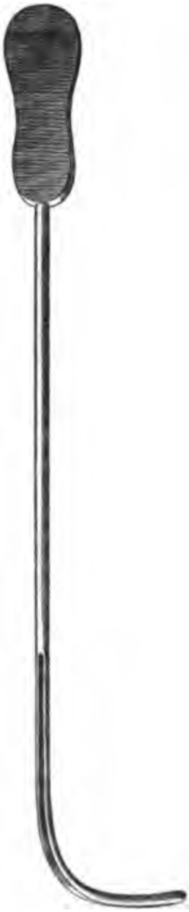


Lithotomy bandage.

the ends being tied in a double knot, or fastened with stout pins. This duty is generally confided to the assistants, for which reason it is often discharged so badly as to be followed by much delay and annoyance, the patient, perhaps, becoming untied during the operation. A careful supervision should, therefore, always be exercised in this respect by the surgeon.

The limbs, bound as here directed, are given in charge of two assistants, who, one standing on each side of the patient, place one hand upon the top of the knee, and the other beneath the sole of the foot. When the operation is about to be commenced, the thighs are moderately separated from each other, and held nearly at a right angle with the trunk. It can easily be perceived how important it must be, in reference to the speedy and successful execution of the operation, that the patient's limbs should be thoroughly controlled, and out of the surgeon's way. It is usually recommended that the staff should be introduced previously to the ligation of the patient; but to such a procedure I am altogether averse, because it is productive of serious annoyance to the patient, and is almost sure to be followed by a premature escape of the urine. Besides, it is a source of inconvenience to the persons who have charge of the limbs. My rule, therefore, always is to tie the patient first, and immediately after to introduce the staff; taking care to confide it to a good, intelligent assistant, one who is thoroughly acquainted with the anatomy of the pelvis, and the different steps of the operation. A poor staff-holder is a great nuisance; for he often excessively embarrasses the surgeon, and makes him commit blunders which he might otherwise avoid. During the operation, the instrument is to be held perpendicularly, with the handle nearly at a right angle with the trunk, and inclined *slightly* towards the right side. The curved portion, securely lodged in the bladder, is hooked up closely against the pubic symphysis. The object of this advice is to prevent the instrument from pressing upon the rectum, which would thus be in danger of being wounded. By inclining the handle of the staff a little towards the right groin, the curved portion is made to bear against the left side of the perineum, with the effect of rendering it somewhat prominent and thereby facilitating the division of the membranous portion of the urethra. The assistant having charge of the instrument stands on the left side of the patient, in order that he may use his right hand, and also hold the scrotum out of the way.

Fig. 508.



Grooved staff.

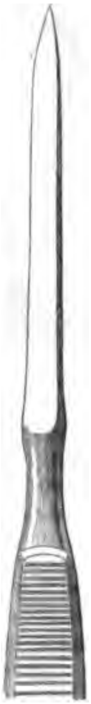
The staff which I am in the habit of using is represented in fig. 508. It is shaped like an ordinary silver catheter, and is about ten inches in length, exclusive of the handle, which should be at least two inches long, by two lines and a half in thickness and fifteen lines in width, with a very rough surface, that it may be the more securely held in the hand. The groove, placed a little towards the left side, and extending from near the middle of the instrument to within a short distance of its beak, should be perfectly smooth, and as deep and as wide as possible. The instrument, warmed and oiled previously to its introduction, should be large enough to distend the urethra to as great a degree as may be compatible with the patient's comfort. By adopting this advice, it will be comparatively easy to find the staff, and to effect, in a safe and proper manner, the division of the neck of the bladder and the prostate gland.

The surgeon, during the operation, sits upon a low, firm chair, or stool, as he may find it most convenient; or he may place himself, as I usually do, in the half-kneeling posture, resting upon the right knee. I generally prefer this posture, because it affords greater freedom to my hands and elbows. A piece of old carpet, or a sheet, is laid upon the floor, under the patient's breech, to receive the fluids.

The knife which I have, for many years, been in the habit of using is the one sketched in fig. 509; it is of simple construction, very light and slender, sharp-pointed, and nearly seven inches in length, of which three are occupied by the blade, which hardly exceeds two lines in width. With this instrument, the lateral operation may be safely and expeditiously executed in all its stages. For enlarging the opening in the prostate and neck of the bladder, after the withdrawal of the staff, I sometimes use the probe-pointed bistoury, delineated in fig. 510, though the sharp-pointed is quite as safe, provided the extremity is carefully guided along the index-finger as it lies in the bottom of the wound.

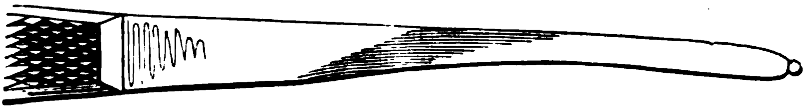
Everything being thus prepared—the bowel cleared out, the instruments arranged on the tray, the limbs tied and held out of the way, the staff in the bladder and in the hand of the assistant, the breech projecting over the table, and the patient fully under the influence of chloroform—the operator is ready to begin. Introducing the index-finger well oiled into the rectum, to induce it to contract, and to enable him to ascertain the position of the staff, and marking with his eye the situation of the tuberosity of the ischium, he stretches the integuments of the perineum with the thumb and finger of the left hand, and commences his incisions. The knife is entered just at the edge of the raphé, on the left side of the perineum, an inch and a quarter above the margin of the anus, and is carried obliquely downwards and outwards, a short distance below the tuberosity of the ischium, and a little nearer to this point than to the anus, as shown in fig. 511. If the part is unusually full, the instrument is plunged in at the first stroke to the depth of at least one inch; otherwise it must be used more cautiously. As the knife descends, it is gradually withdrawn from its deep position, so as to give the wound a sloping appearance. The length of the incision must be regulated by the size of the perineum and the age of the patient; but, in the adult, it should not, in general, be less than from three to three inches and a half. In the young subject it must be proportionately smaller.

Fig. 509.



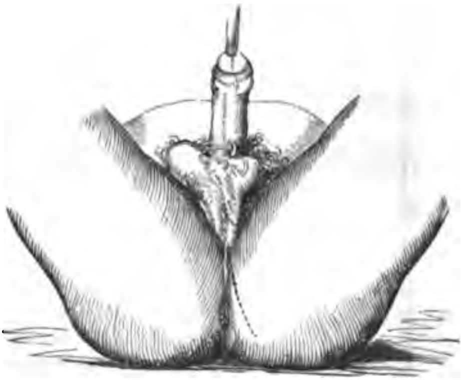
The author's lithotomy knife.

Fig. 510.



Beaked knife.

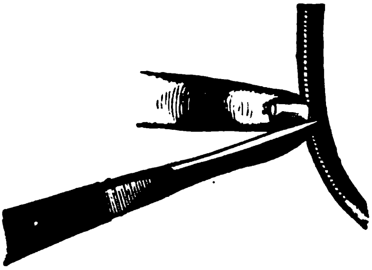
Fig. 511.



Lateral operation for stone.

Placing the point of the left index-finger in the upper angle of the wound, the knife is re-entered just by the side of it, and is made to divide, by repeated touches with its edge, the deep cellular substance of the perineum, the transverse muscle, and a portion of the triangular ligament, with a few of the fibres of the elevator muscle of the anus. The membranous portion of the urethra being thus exposed, a little in front of the prostate gland, the surgeon feels for the groove of the staff, at the bottom of the wound, and cuts into it through the denuded tube, the finger-nail serving as a guide to the point of the knife, as in fig. 512. The length of the opening in the urethra need not exceed the third of an inch.

Fig. 512.



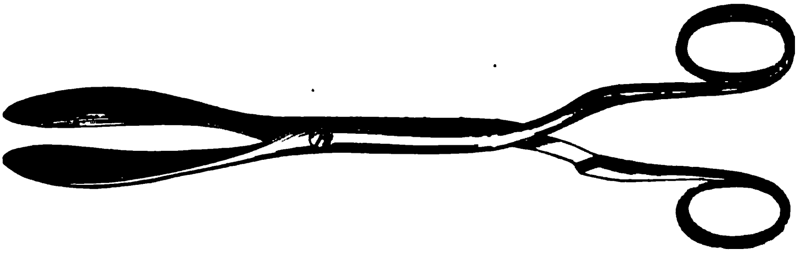
The finger and knife in the groove of the staff.

The knife, inserted into the groove of the staff, through the opening in the urethra, is now carried on into the bladder, dividing, as it proceeds, the neck of the organ and the left lobe of the prostate, in a direction obliquely downwards and outwards, which is in that of its long axis. In executing this step of the operation, the rectum is to be held out of the way, by pressing it over towards the right side with the left index-finger, which should be steadily kept in the bottom of the wound, from the moment of the first incision. Great care should also be taken not to prolong the incision in the prostate gland too far back, for fear of penetrating the reflection of the pelvic fascia and the adjacent venous plexus.

As soon as the bladder has been opened, the urine generally escapes in a gush; the knife is now removed, and the finger, lying in the bottom of the wound, is placed in contact with the staff, which is immediately withdrawn. The urine, as it passes off, commonly forces the calculus down against the artificial opening, so as to afford the surgeon an opportunity of ascertaining its form and bulk. When this does not happen, the finger is carried into the bladder to its full length, and used as a searcher. If the stone is found to be disproportionately large, the wound must immediately be dilated, either with the finger or the bistoury, according as the resistance may seem to depend upon the prostate or the muscular structures. In elderly subjects, the instrument will generally be necessary, as the gland is not sufficiently lacerable to yield to pressure.

The incisions being completed, the next step of the operation is to extract the calculus. This is to be done with the forceps, fig. 513, which are conveyed into the bladder along the upper surface of the index-finger, lying in the bottom of the wound, in contact with the foreign body. The forceps are introduced with the blades closed, and are used at first as a searcher. As soon as they are brought in contact with the concretion, the blades are expanded over it, in the direction of its long axis, with a firm grasp, to prevent the risk of slipping, as seen in fig. 514. Taking care that the instrument does not embrace any of the folds of the mucous membrane, the operator endeavors to extract the foreign

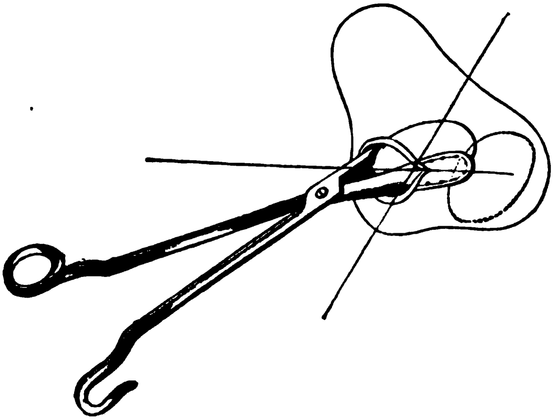
Fig. 513.



Lithotomy forceps.

substance by gently moving the forceps from side to side, or upwards and downwards, on the same principle as in the delivery of the child's head. The facility with which the stone may be seized depends upon circumstances. In general, it lies in contact with the inner extremity of the wound, and may readily be caught in the embrace of the blades of the instrument. Sometimes, however, as when it is lodged in the bas-fond of the organ, it refuses to come down, and may thus embarrass the operator. The difficulty, as will be particularly mentioned hereafter, is easily remedied by inserting the finger into the rectum, and pushing the concretion forwards against the forceps. When the stone is situated in the superior fundus of the bladder, the forceps must be carried high up, in the direction of the long axis of the pelvis, where they are to be moved about as a searcher. Occasionally it lies behind the pubic symphysis, and cannot be seized until it has been dislodged by pressure upon the inferior part of the hypogastric region, aided by the finger in the bladder.

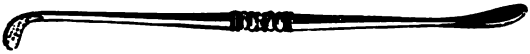
Fig. 514.



Mode of introducing the forceps and seizing the stone.

If the calculus is very small, it is sometimes more easily extracted with the scoop, seen in fig. 515, than with the forceps. The same instrument should be used when the concretion has been broken, whether accidentally or designedly, into fragments, which must then be removed piecemeal. The scoop is about ten inches in length, and is shaped, as its name indicates, at each extremity, like a spoon, or, instead of this, one end is provided with a suitable handle. An instrument like this may be made very serviceable in extracting an adherent, encysted, or impacted concretion. The mode of grasping and holding the stone is exhibited in fig. 516.

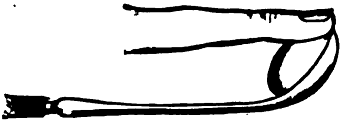
Fig. 515.



Lithotomy scoop.

As soon as the foreign body has been extracted, the bladder is washed out with tepid water, thrown up in a full stream from a large syringe. Any pieces or fragments that may have escaped the forceps or scoop are thus removed; otherwise, there will almost certainly be a return of the calculous affection, the smallest particle frequently serving

Fig. 516.



Scoop and finger grasping the calculus.

Placing the point of the left index-finger in the upper angle of the wound, the knife is re-entered just by the side of it, and is made to divide, by repeated touches with its edge, the deep cellular substance of the perineum, the transverse muscle, and a portion of the triangular ligament, with a few of the fibres of the elevator muscle of the anus. The membranous portion of the urethra being thus exposed, a little in front of the prostate gland, the surgeon feels for the groove of the staff, at the bottom of the wound, and cuts into it through the denuded tube, the finger-nail serving as a guide to the point of the knife, as in fig. 512. The length of the opening in the urethra need not exceed the third of an inch.

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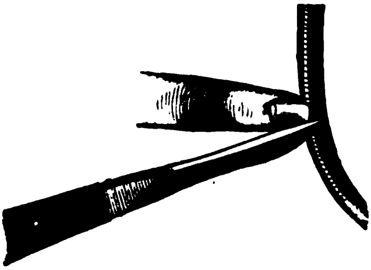

The finger and knife in the groove of the staff.

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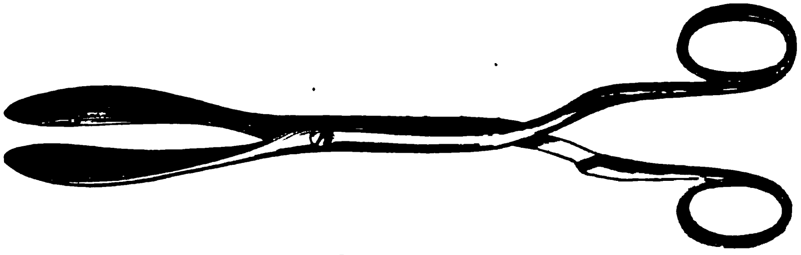

Lithotomy forceps.

the bladder along the upper surface of the index-finger, lying in the bottom of the wound, in contact with the foreign body. The forceps are introduced with the blades closed, and are used at first as a searcher. As soon as they are brought in contact with the concretion, the blades are expanded over it, in the direction of its long axis, with a firm grasp, to prevent the risk of slipping, as seen in fig. 514. Taking care that the instrument does not embrace any of the folds of the mucous membrane, the operator endeavors to extract the foreign substance by gently moving the forceps from side to side, or upwards and downwards, on the same principle as in the delivery of the child's head. The facility with which the stone may be seized depends upon circumstances. In general, it lies in contact with the inner extremity of the wound, and may readily be caught in the embrace of the blades of the instrument. Sometimes, however, as when it is lodged in the bas-fond of the organ, it refuses to come down, and may thus embarrass the operator. The difficulty, as will be particularly mentioned hereafter, is easily remedied by inserting the finger into the rectum, and pushing the concretion forwards against the forceps. When the stone is situated in the superior fundus of the bladder, the forceps must be carried high up, in the direction of the long axis of the pelvis, where they are to be moved about as a searcher. Occasionally it lies behind the pubic symphysis, and cannot be seized until it has been dislodged by pressure upon the inferior part of the hypogastric region, aided by the finger in the bladder.

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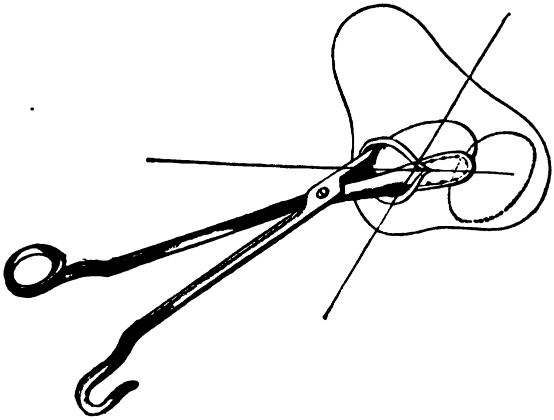

Mode of introducing the forceps and seizing the stone.

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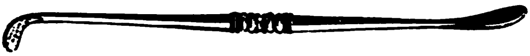

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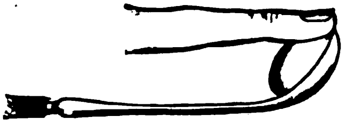
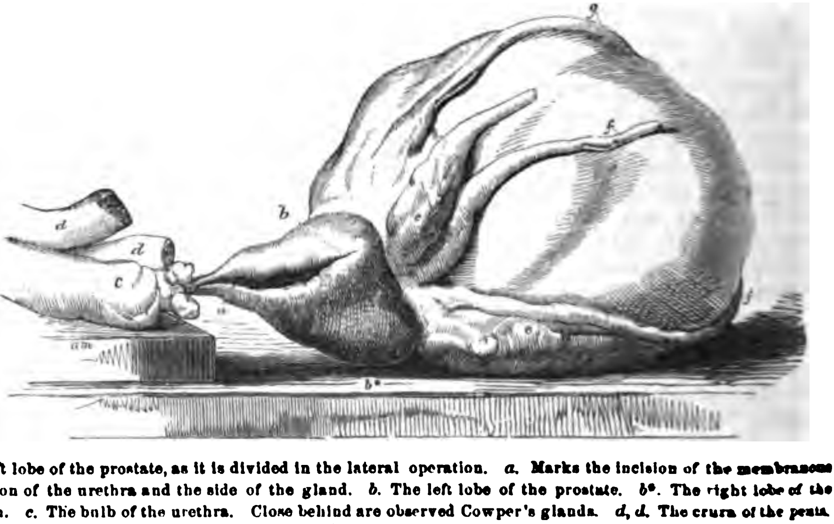


Scoop and finger grasping the calculus.

as a nucleus for a new concretion. The bladder having been washed out, a female sound is next introduced through the wound into the interior of the viscus, with a view of ascertaining whether any stones or fragments have been left behind. Should this be the case, the forceps, scoop, and syringe are again used till complete clearance is effected. In general, when the stone is rough, it is an evidence that it is solitary; but to this rule there are occasional exceptions. The operation being finished, the patient is conveyed to his bed, a piece of oil-cloth and a folded sheet being placed under his breech, to protect the clothing and absorb the urine.

Extent of the Incision of the Prostate.—The wound should in no instance, however bulky the stone may be, extend entirely through the lateral lobe of the prostate, on account of the danger of urinary infiltration. When the concretion is very voluminous, it should either be broken, and extracted piecemeal, or, what is better, the opening should be enlarged by incising the opposite half of the gland. If this does not afford sufficient room, the calculus should be crushed. In ordinary cases, I incise the organ only to a very limited extent, and immediately after enlarge the opening with the finger, the pressure of which is generally amply sufficient for the purpose. When it is not, the probe-pointed bistoury is used as a substitute. In old subjects, with induration and enlargement of the gland, the division is generally obliged to be effected with the instrument. The outer wound, on the other hand, should always be ample and dependent. The direction and extent of the incision in the prostate gland are represented in fig. 517, from Scarpa.

Fig. 517.

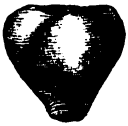


Left lobe of the prostate, as it is divided in the lateral operation. *a.* Marks the incision of the membranous portion of the urethra and the side of the gland. *b.* The left lobe of the prostate. *b**. The right lobe of the organ. *c.* The bulb of the urethra. Close behind are observed Cowper's glands. *d, d.* The crura of the penis. *e, e.* The seminal vesicles. *f, f.* The deferent ducts. *g.* The ureter of the left side.

In children from eighteen months to ten years, if, indeed, not until a considerably later period, the prostate is so small as to render the introduction of the finger and the forceps into the bladder, and consequently the extraction of the calculus, however diminutive, impracticable without the division of the gland in its entire length. I am quite sure that this has happened in all my operations, upwards of fifty in number, and yet I have never met with a solitary instance in which the procedure was followed by infiltration of urine. The annexed drawings, figs. 518 and 519, copied from personal dissections, exhibit the size and shape of the prostate at four and twelve years.

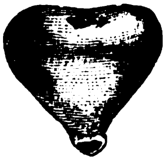
Beyond the fact here mentioned, lithotomy in the child presents nothing peculiar. The operation is generally one of the most easy and simple in surgery. My practice now invariably is to make a small external incision, and, after opening the membranous portion of the urethra, to divide the prostate gland and neck of the bladder with the finger. This can always be done with the greatest facility, as these structures, at this period of life, are remarkably soft and lacerable. To prevent the knife from passing into the cellular substance between the bladder and the rectum, the index-finger should be kept in close contact with the upper part of the wound, just below the arch of the pubes, otherwise the instrument may wander away from the staff, and thus lead to the idea that the bladder has been penetrated, when, in reality, it has not been opened at all. The staff should not be withdrawn until the surgeon is well assured that the finger is fully in the organ, or, what is still better, in contact with the stone. Extraction is usually easily effected, either with the forceps or the scoop.

Fig. 518.



Prostate at four years.

Fig. 519.



Prostate at twelve years.

Difficulties of Extraction.—Difficulty frequently occurs in the extraction of the stone. This may depend, 1st, upon the stone itself; 2d, upon the bladder; and 3d, upon the pelvis.

1st. The impediment may be caused by the lodgment of the stone in the bas-fond of the bladder, which is sometimes converted into a sort of cul-de-sac. The remedy is to raise the stone up, and place it within reach of the instrument, with the left index-finger, inserted in the rectum. When the stone is lodged above the pubes, it is to be displaced, while compression is made upon the hypogastrium, with a strong probe, bent into a hook, or it may be drawn down with the index-finger.

2d. The stone may be entangled in the folds of the mucous membrane; or it may be spasmodically grasped by the bladder, which may thus prevent the blades of the forceps from being expanded over it. In the former case the scoop replaces the forceps, or, if this fail, dislodgment may be attempted by throwing cold water into the bladder, in a full stream, from a large syringe. Anæsthetic agents are the most useful in relieving the spasm.

3d. The stone may be encysted. When this is the case, it is advisable to introduce the finger into the bladder and to rupture the cyst with the nail, or, when this is impracticable, to divide it with a probe-pointed bistoury, or a knife, fashioned like a gum lancet, and furnished with a long handle. Embarrassment may be occasioned by the presence of a pouch between the bladder and the rectum.

4th. It may be difficult to seize the stone on account of the great depth of the perineum, which is sometimes upwards of three inches.

5th. The stone, under the grasp of the forceps, may break into numerous fragments, be reduced to a soft pulpy mass, or be crushed into small sandy particles. The fragments, according to their size, may be removed with the forceps, scoop, or syringe.

6th. Delay and inconvenience may arise from the presence of a considerable number of calculi.

7th. Embarrassment may proceed from the manner in which the stone is grasped. When there is reason to believe that it has been seized by its long diameter, the finger should at once be introduced into the wound to ascertain the fact, and to effect the necessary change. Before this can be done, however, the forceps must relax their hold upon the calculus, though there will be no need of withdrawing them.

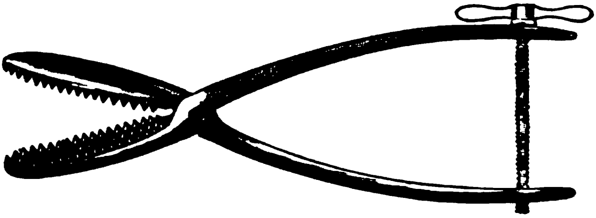
8th. Embarrassment occasionally results from an inability to find the concretion. This may depend upon some of the causes already detailed; or, it may be owing to the expulsion of the stone, especially if it is of small volume, at the moment of completing the section of the bladder and the prostate gland.

9th. Great impediment sometimes arises from the size of the stone. When this is the case, the extraction is to be accomplished either by simply enlarging the wound, if this has not already been done, to the utmost permissible limits;

by incising the right lobe of the prostate to the same extent as the left; or, finally, by breaking the concretion, and removing it piecemeal.

10th. Dilatation of the wound is effected with the probe-pointed bistoury, carried downwards and outwards in the direction of the original incision, while the stone is held firmly by the forceps. Or, the right lobe of the prostate is divided, if necessary, in the same manner and in the same direction as the left. These two methods may almost always be resorted to with a reasonable prospect of success, when the weight of the stone does not exceed three or four ounces. When the concretion is very bulky, crushing will generally be necessary; and for this purpose I know of no better instrument than the forceps represented in fig. 520. They are constructed upon the principle of an ice-masher, and do their work most effectually.

Fig. 520.



Stone-crusher.

11th. Embarrassment of a very serious, if not an insurmountable, character, may arise from unusual narrowness of the pelvis.

12th. The calculus occasionally coexists with calcareous incrustation of the surface of the bladder. The proper procedure is, first, to extract the stone in the usual manner, and then to remove the deposit with the forceps, scoop, and finger, aided with the syringe.

Lastly, calculi of large size, weighing ten, twelve, and even fifteen ounces, have occasionally been successfully extracted. Most generally, however, the patient dies either from exhaustion during the operation, or a short time after from the effects of inflammation.

Accidents.—The accidents that are liable to occur, during and after the lateral operation, are hemorrhage, prostration, retention of urine, undue inflammation of the wound, cystitis, injury of the prostate gland, urinary infiltration, peritonitis, tetanus, wound of the rectum, incontinence of urine, impotence, perineal fistule, orchitis, and explosion of pre-existing disease.

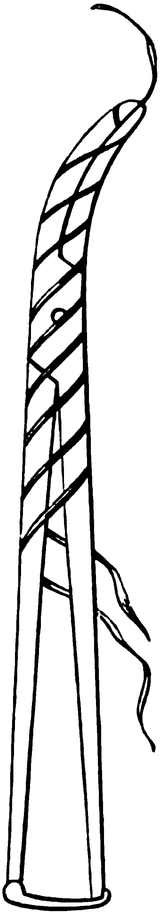
1. *Hemorrhage.*—The hemorrhage after perineal lithotomy is usually very slight, not exceeding two or three ounces. It may be arterial or venous, primary or secondary. Its principal sources are the artery of the bulb and the superficial artery of the perineum. In old subjects, a copious flow of blood occasionally proceeds from the veins of the neck of the bladder and of the prostate gland. The pudic artery, in its natural course, can hardly be wounded posteriorly; anteriorly, however, it is more exposed, and, therefore, in danger of being injured. The accident is most likely to happen when the prostate is divided with the gorget, or the lithotome caché. The artery of the bulb sometimes bleeds profusely; and, from its deep position, and the readiness with which it retracts, is always secured with difficulty.

A tremendous gush of blood sometimes proceeds from the transverse perineal artery. The bleeding generally follows the first incision, and should immediately be arrested by the ligature. The superficial perineal artery is seldom cut; when it is, the bleeding is usually insignificant.

When the affected vessel is deep-seated, the blood, instead of escaping externally, may pass into the bladder, where it is either retained, or expelled from time to time in thick clots. The organ, in the latter case, forms a hard, solid tumor, which is more or less tender on pressure, and which may mount as high up as the umbilicus. The expulsion of the clots is attended with violent spasm and tenesmus, bearing a close resemblance to labor pains.

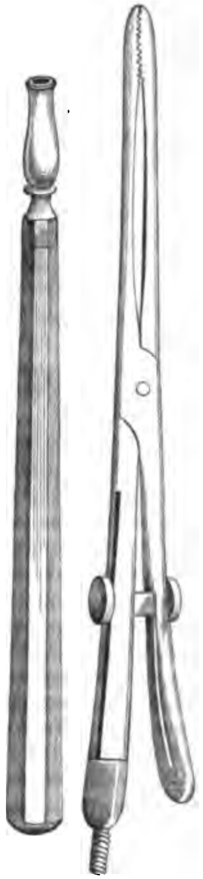
When the bleeding vessel is accessible, the proper means for arresting the hemorrhage is, of course, the ligature. When it is very deep-seated, it may generally be readily seized with Physick's artery forceps, delineated in fig. 521, the edges of the wound being separated with retractors, the fingers, or a pair of lithotomy forceps. When the artery is situated very far back, at the neck of the bladder, or by the side of the prostate gland, it may be extremely difficult, if not impossible, to ligate it. To meet this contingency I devised, some years ago, a pair of forceps, which, after having grasped the artery, may be permanently retained, by unscrewing its handle, until all danger from hemorrhage is over. The instrument is represented in fig. 522.

Fig. 521.



Physick's forceps.

Fig. 522.



The author's artery compressor.

Compression may be resorted to, when it is impossible to use the ligature or torsion. A canula, fig. 523, consisting of silver, or gum-elastic, three inches and a half long by four lines in diameter, surrounded by charpie, sponge, or cotton, and pierced with two holes at the perineal extremity for securing it, by means of threads, to a T-bandage, is introduced into the bladder, thus serving the twofold purpose of conducting off the urine, and compressing the bleeding vessel. It should be retained for several days, or until there is reason to believe that all danger of hemorrhage is over. When no canula is at hand, a female catheter, a piece of reed, or the spout of a tin coffee-pot, may be used as a substitute. Plugging of the wound is particularly necessary when the hemorrhage proceeds from enlarged and varicose veins at the neck of the bladder and prostate gland, or when the blood oozes from a great many small arteries, too minute to be tied. The operation, of course, always interferes with the union of the wound.

Fig. 523.

Canula for plugging the wound in lithotomy.

Styptics are sometimes useful, especially in deep-seated venous hemorrhage, the best articles for the purpose being alum, acetate of lead, and persulphate of iron. The actual cautery can selom be required.

Occasionally the hemorrhage is promptly arrested by directing a concentrated stream of cold water from a syringe upon the bleeding spot. Exposure of the wound to the cold air, and keeping it free from clots, is also sometimes highly beneficial.

Secondary hemorrhage generally takes place as soon as reaction is established, or the patient has recovered from the shock of the operation. The means already pointed out will usually be sufficient to arrest it.

2. *Sinking.*—Few patients, at the present day, suffer seriously from shock in this operation. Should such an event arise, as it may when there is great debility, or rough and prolonged manipulation, especially in very young children and elderly subjects, recourse must be had to stimulants, care being taken during reaction that over-excitement does not occur.

3. *Retention of Urine.*—This may be caused by inordinate tumefaction of the wound, and spasm of the urethra; or, as more frequently happens, by closure of these passages by coagulated blood. In the former case relief is afforded by the catheter; in the latter, by clearing away the blood, and preventing further hemorrhage.

4. *Inflammation of the Wound.*—Undue inflammation of the wound, if it should take place, usually supervenes within the first forty-eight hours. The action is sometimes erysipelatous, and is then apt to spread. The treatment should be strictly antiphlogistic, combined with gently supporting measures, if there is any tendency to prostration.

5. *Phlebitis.*—This disease occasionally occurs after this operation. It is most frequently met with in elderly subjects. The treatment, although antiphlogistic, is conducted cautiously, and with due regard to the state of the system.

When the phlebitis attacks the extremities, the proper local remedies will be leeches, fomentations, iodine, and blisters, followed by free incisions to afford vent to effused and pent-up fluids. The system must be supported by anodynes and stimulants. Venesection is generally inadmissible; and mercury, except in so far as it may tend to correct the secretions, is of no use. After the violence of the inflammation has subsided, the limb should be bandaged; and, as soon as the patient can move about, change of air should be advised.

6. *Cystitis.*—Slight cystitis is by no means uncommon after this operation, setting in within the first few days, and manifesting itself by a frequent desire to urinate, with more or less spasm, and a sense of weight and bearing-down pains. The most suitable remedies are hot applications to the perineum and hypogastrium, diluent drinks, and liberal doses of morphia. When the inflammation is urgent, local and general bleeding may be required.

In some cases, the inflammation, instead of attacking the bladder, invades the connective tissue between this organ and the rectum, and soon terminates in extensive suppuration, or the formation of abscesses. The occurrence is usually associated with serious renal disease, and generally ends fatally in from three to four weeks after the operation.

7. *Lesion of the Prostate Gland.*—This gland may be gravely injured in this operation, either by the knife, the finger, the forceps, or the calculus. The most serious mischief is usually inflicted by the forceps. The accident, however, is extremely rare, and ought never to happen in the hands of a skilful lithotomist. The treatment must be conducted upon general antiphlogistic principles.

8. *Urinary Infiltration.*—One of the most dangerous effects of lithotomy is an escape of urine into the cellular tissue of the perineum, or of the perineum and the parts immediately around the neck of the bladder. Its occurrence is favored by too free a division of the prostate gland; by the small size of the wound, or by its being too conical or sloping; by the early and inordinate tumefaction of the cut surfaces; and, above all, by the perforation of the reflected portion of the pelvic fascia. The attack usually comes on within a short time after the operation, and often runs its course with frightful rapidity.

Little can be done to arrest the progress of this affection when once established. Depletion by the lancet and by purgatives is wholly inadmissible. The system is to be sustained by such remedies as carbonate of ammonia, quinine, iron, camphor, and capsicum, in combination with the liberal use of brandy and opium. The best topical means are saturnine and anodyne fomentations, medicated cataplasms, injections of a weak solution of nitric acid or chlorinated soda, and touching the whole track of the wound as early as possible with nitrate of silver, or the tincture of iodine. When the infiltration is caused by the small size, ill shape, or improper direction of the wound, the defect must be remedied by the knife, to afford a free outlet for the urine. Leeches and hot fomentations may be applied to the hypogastric region.

9. *Peritonitis.*—Peritonitis seldom follows the lateral operation, but is occasionally observed as a consequence of the high. Mr. Henry Thompson, of London, asserts that this occurrence is much more frequent in children than in adults, and that, in them, it constitutes one of the chief sources of danger. As for myself, I have not noticed anything of the kind; indeed, I have met with peritonitis only in a single instance, after the lateral operation, in 80 cases. Much of the danger of peritonitis will, it may be presumed, depend upon the manner in which the operation is performed.

The treatment must be prompt and vigorous. Blood should be taken by the lancet, or, when this is inadmissible, by leeches from the hypogastrium, succeeded by anodyne fomentations. The bowels are thoroughly confined with opium, and the pulse is kept down with aconite and other depressants.

10. *Pyemia.*—Pyemia is probably of more frequent occurrence after this operation than is generally supposed. In 186 cases of lithotomy, analyzed by Mr. Smith, of Leeds, 4 perished from this cause. I have myself met with pyemia only once in 80 cases. The patient was a boy, three years old, who, although everything went on most favorably for the first week, died on the twenty-eighth day from numerous little abscesses in the left kidney. The wound itself was nearly healed.

Pyemia, as an effect of lithotomy, is most liable to occur in broken-down persons, especially if the stone is of great size, or the operation is unusually protracted, painful, or bloody. The disease, generally announced by violent rigors, followed by copious sweats and rapid prostration, may set in within the first twenty-four hours, although seldom so early, and usually ends fatally in less than a week. The structures which are most liable to suffer from abscesses are the kidneys, lungs, liver, joints, and cellular tissue. The treatment, which is seldom of any avail, is supportive, milk punch, quinine, and anodynes being the chief means.

11. *Tetanus.*—This sometimes occurs, but very rarely. Should an attack be threatened, the proper remedies are anodynes and antispasmodics, aided, if there is unusual debility, by brandy, wine, or porter. Chloroform is a valuable adjuvant, when there is much suffering, in controlling muscular action.

12. *Wound of the Rectum.*—This accident may happen, but will not be likely to do so if the proper precautions are taken in performing the operation. The opening, which is generally situated immediately in front of the neck of the bladder, soon begins to diminish, and usually closes in a few weeks.

The treatment consists in preventing the bowels from acting, except every third or fourth day, by means of anodynes, in washing out the rectum frequently with cold water, in permitting none but the most bland and simple food, and in enjoining strict recumbency.

13. *Sloughing of the Rectum.*—This is most liable to take place in weakly, dilapidated subjects. The immediate cause of the occurrence is probably slight infiltration of urine, in consequence of the great and unnecessary depth of the wound, or injury done to the recto-vesical septum during the extraction of the calculus. No definite rules can be laid down respecting the treatment, which must be regulated by the circumstances of each individual case. In general, it will be necessary to support the strength by proper diet and by tonics, especially quinine, wine, and brandy.

14. *Incontinence of Urine.*—Incontinence of urine, consequent upon perineal lithotomy, is happily infrequent. It is not always easy to determine how this accident is produced. Most commonly, however, it arises from injury inflicted upon the neck of the bladder during the extraction of a large and very

rough calculus, though I have known it to occur when the stone was unusually small.

When there is a probability that incontinence of urine will take place, every effort should be made to prevent it. The patient should be strictly confined to his bed, a warm bath should be administered once a day, for twenty-five or thirty minutes at a time, cold water should frequently be thrown into the rectum, and free use should be made of demulcent drinks.

When the affection is fully established, it will be necessary to leech the perineum occasionally, and to apply gentle but steady pressure upon it with the pad of a T truss. In obstinate cases, cauterization of the neck of the bladder and the commencement of the urethra may be tried.

15. *Impotence.*—This, like incontinence of urine, is very rare after perineal lithotomy. It doubtless depends upon injury inflicted upon the ejaculatory ducts by the knife, and does not admit of relief.

16. *Perineal Fistule.*—The wound made in lithotomy generally heals in from three to four weeks; but sometimes it remains open much longer, and occasionally it does not close at all, but degenerates into a fistule, the existence of which is determined by the appearance of the urine at the external opening, and by an examination with the probe.

The treatment consists in retaining a silver catheter constantly in the urethra, and in cauterizing, every fourth or fifth day, the neck of the bladder with nitrate of silver. The patient should be confined to his back, with the nates elevated. When the track is unusually small, or the perineum uncommonly thin, relief may sometimes be afforded by the occasional introduction of a heated probe, wire, or knitting needle. In intractable cases, it may be necessary to incise the parts.

17. *Orchitis.*—Acute swelling of the testicle occasionally follows this operation. I have seen only two cases of it in my own practice; a circumstance which leads me to suppose that it is infrequent. It seldom comes on before the end of the second or third week, and is no doubt due to injury inflicted upon the ejaculatory ducts in the division of the prostate gland or during the extraction of the calculus. It generally involves only one organ. The treatment is the same as in ordinary orchitis, the disease usually yielding in a few days.

18. *Explosion of Pre-existing Disease.*—Stone, as is well known, frequently coexists with other diseases, which, whether latent or open, often acquire new intensity on the removal of the vesical irritation. The organs most likely to suffer in this manner are the kidneys, bowels, brain, heart, and lungs. In old subjects death occasionally occurs during the progress of the cure from apoplexy.

After-treatment.—As soon as the stone has been extracted, the bladder washed out, and the bleeding arrested, the patient is carried to his bed, always properly arranged beforehand. It should be provided with slats, and a cotton, moss, or hair mattress, covered with a sheet, over which is spread a large piece of soft oil-cloth. Another sheet, called the draw-sheet, folded several times, and arranged so as to make the middle of it correspond with the buttocks, is placed upon the top of the oil-cloth, and serves to ward off pressure, as well as to receive the secretions as they flow from the wound. The head and shoulders should be slightly elevated by a pillow.

My experience is that it matters little, if any, what posture the patient assumes after he has been put to bed. I usually, however, request him to lie on his right side for the first five or six hours, to afford the lips of the wound an opportunity of becoming glazed with lymph before he is obliged to urinate. At the end of this period, and, indeed, often much earlier, I permit him to rest upon his back, or upon either side, as may be most agreeable. Young subjects, unless they are incessantly watched, seldom remain in the same posture beyond a few minutes, and I have never seen a case in which any detriment resulted from this source.

It is equally unnecessary, in my judgment, to tie the patient's knees together after the operation; or to introduce a tube into the bladder by the wound, to conduct off the urine, with a view, as is alleged, of preventing infiltration of the surrounding cellular tissue. The expedient can never be required except in those cases in which the incisions are unusually extensive.

The urine sometimes begins to flow by the wound in a few minutes after the operation; but, in general, very little, if any, passes for the first three or four hours. It then usually comes away in a gush, attended with pain and spasm of the neck of the bladder. By the end of the first day, the edges of the wound are commonly so much swollen as to compel the urine to issue mainly by the urethra. This, however, rarely continues beyond twenty-four or thirty-six hours, when the tumefaction has generally so far subsided as to allow the fluid to resume its original course. The period at which it begins to pass off permanently by the urethra varies from ten to fourteen days. The change in the direction of the fluid is always attended with more or less pain at the neck of the bladder, and a scalding, smarting, or burning sensation in the urethra and head of the penis.

The treatment after the operation must be strictly antiphlogistic. The patient is kept quietly in the recumbent position, and all excitement, both bodily and mental, is sedulously guarded against. The pain consequent upon the operation is often extremely severe. It generally makes its appearance as soon as the patient wakes from the effects of the chloroform, and should be promptly met by a full dose of morphia.

Demulcent drinks should be used freely throughout the treatment, especially in the earlier stages. They serve both to allay thirst and to dilute the urine. They may be simple, or combined with nitrate of potassa, bicarbonate of soda, or dilute nitric acid, according to the particular indications of the case.

The diet must be light, unirritant, and of the most simple kind. For the first few days the patient should take little else than panada, gruel, animal broth, or milk and bread. After that he may use rice, toast and tea, crackers, or mush and milk. No meat or vegetables should be permitted under five or six days, unless there is marked evidence of debility.

My invariable rule after this operation is to lock up the bowels for the first three days with a full anodyne, administered as soon as the patient has sufficiently recovered from the effects of the anæsthetic. At the end of this time a dose of castor oil or Rochelle salts is ordered, assisted, if necessary, by an enema.

Every possible attention should be paid to the cleanliness and comfort of the patient. Excoriation should be guarded against, and the scrotum kept out of the way of the wound by a suspensory bandage.

If the edges of the wound should become covered with the earthy phosphates, the best remedy will be the nitric acid lotion, in the proportion of about four drops of acid to the ounce of water, applied by means of a folded cloth. When the incrustation extends far back, the fluid may be daily injected into the bladder. In most cases the local application should be aided by the internal exhibition of the remedy. When the wound is tardy in healing, or has contracted to a mere orifice, a catheter ought to be permanently retained in the bladder, to conduct off the urine through the natural channel.

Although the wound made in this operation occasionally unites by the first intention, such an event must be extremely rare. I do not recollect a solitary example among my own cases, in which the parts were seriously bruised in the extraction of the calculus, or unduly divided in making the deep incisions, and yet I have never had an instance of union by the first intention, properly so called.

Statistics.—Of 895 cases of the lateral operation of lithotomy in the practice, chiefly private, of American surgeons, 851 were cured, and 44 died, making a proportion of 1 death in $20\frac{1}{3}$. In 426 of these the gorget was used, and in 424 the knife, with a mortality for the former of 1 in $23\frac{7}{18}$, and for the latter, of 1 in $19\frac{4}{11}$.

Of 1,596 cases of the lateral operation in the private and hospital practice of European surgeons, 1,464 were cured, and 132 died, making a proportion of 1 in $12\frac{1}{11}$.

Table of 1535 *Cases of the Lateral Operation of Lithotomy with the Knife.*

Operators.	Cases.	Recoveries.	Deaths.	Ratio.
Cheselden	213	190	20	1 in $10\frac{13}{20}$
Martineau	84	82	2	1 in 42
Kern	334	303	31	1 in $10\frac{24}{31}$
Liston	115	99	16	1 in $7\frac{3}{16}$
B. B. Cooper	134	125	9	1 in $14\frac{8}{9}$
Brett	108	101	7	1 in $15\frac{3}{7}$
Pollak	120	114	6	1 in 19
Zett	108	105	3	1 in 35
Raddock	77	72	5	1 in $14\frac{2}{5}$
Teale	53	40	13	1 in $3\frac{1}{13}$
Véricel	109	100	9	1 in $10\frac{1}{9}$
Gross	80	76	4	1 in 20
Total	1535	1407	125	1 in $11\frac{1}{4}$

Pouteau operated with the single lithotôme upon 120 cases with a loss of 3; Crichton saved 186 out of 200, cut partly with the knife and partly with the gorget; and Dudley, who operated exclusively with the gorget, had 207 cases with a loss of 6. Wattmann, of Vienna, who always employed a large knife, shaped somewhat like a gorget, lithotomized 180 cases, of which 146 recovered, and 34 died.

Table of the Results of 3770 *Cases of the Lateral Operation in different Hospitals.*

Hospitals.	Cases.	Recoveries.	Deaths.	Ratio.
Pennsylvania Hospital	83	73	10	1 in $8\frac{3}{10}$
Lunéville Hospital	365	332	33	1 in $11\frac{2}{33}$
Hôtel-Dieu, Paris	39	30	9	1 in $4\frac{1}{3}$
La Charité, Paris	34	19	15	1 in $2\frac{4}{15}$
Hôpital des Enfans, Paris	60	51	9	1 in $6\frac{2}{3}$
St. Mary's, Moscow	411	369	42	1 in $9\frac{11}{14}$
Norwich Infirmary	704	611	93	1 in $7\frac{53}{93}$
Bristol Infirmary	354	275	79	1 in $4\frac{38}{79}$
Leeds Infirmary	197	169	28	1 in $7\frac{1}{28}$
St. Thomas's Hospital, London	144	129	15	1 in $9\frac{3}{5}$
Royal Infirmary, Aberdeen	23	22	1	1 in 23
Loretto Hospital, Naples	553	471	82	1 in $6\frac{61}{82}$
Guy's Hospital, London	230	197	33	1 in 6
Cambridge	183	170	13	1 in 14
Oxford	110	96	14	1 in 8
Leicester	90	82	8	1 in 11
Birmingham	100	90	10	1 in 10
University College Hospital	90	78	12	1 in $7\frac{1}{2}$
Total	3770	3264	506	1 in $6\frac{1}{2}$

The subjoined tables, copied from Mr. Crosse's work, exhibit the influence of the age and weight of the calculus upon the mortality of the lateral operation in 704 cases performed at the Norfolk and Norwich Hospital.

Results of 704 Cases of the Lateral Operation, as influenced by the Age of the Patient.

Ages.	Cases.	Cures.	Deaths.	Ratio.
From 1 to 10	281	262	19	1 in $14\frac{15}{19}$
" 11 to 20	106	97	9	1 in $11\frac{7}{9}$
" 21 to 30	48	43	5	1 in $9\frac{3}{5}$
" 31 to 40	48	45	3	1 in 16
" 41 to 50	47	37	10	1 in $4\frac{7}{10}$
" 51 to 60	96	71	25	1 in $3\frac{21}{25}$
" 61 to 70	70	50	20	1 in $3\frac{1}{2}$
" 71 to 80	8	6	2	1 in 4
Total	704	611	93	1 in $7\frac{53}{93}$

Mortality of 704 Cases of the Lateral Operation, as influenced by the size of the Calculus.

Weight in ounces.	Cases.	Cures.	Deaths.	Ratio.
1 ounce and under	529	482	47	1 in $11\frac{12}{47}$
1 to 2 ounces	119	101	18	1 in $6\frac{11}{18}$
2 to 3 "	35	19	16	1 in $2\frac{3}{16}$
3 to 4 "	11	4	7	1 in $1\frac{4}{7}$
4 to 5 "	5	2	3	1 in $1\frac{2}{3}$
5 to 6 "	2	2	....	
6 to 7 "	2	....	2	
7 to 8 "	1	1	....	
Total	704	611	93	1 in $7\frac{53}{93}$

From January, 1854, to July, 1857, 186 persons were operated upon for stone in the bladder in the London Hospitals. Of these 146 recovered, and 40 died; 137 were under 20 years of age, and of these 123 recovered, and 14 died; of the 49 adults 23 recovered, and 26 died.

In the Provinces, in the four years and a half, ending with 1860, 175 operations were performed, with 153 cures, and 22 deaths. Of the entire number 121 were under 20 years of age, and of these 113 recovered, and 8 died: of the 54 adults 14 died, and 40 recovered.

Mr. Richardson, by whom these facts have been reported, ascribes the differences which they present to dissimilarity in the hygienic arrangement of the London and Provincial Hospitals, and to the fact that the former are often overcrowded with all kinds of patients.

The circumstances which tend to influence the results of the lateral—as, indeed, of every other operation of lithotomy—are exceedingly numerous and diversified in their character, and are worthy of profound consideration. The most important of these circumstances are referable, 1st, to the skill of the surgeon; 2dly, the preparation, age, and health of the patient; 3dly, the nature, volume, and situation of the concretion; and, 4thly, the selection of our cases.

Most of the patients that I have cut were under twelve years of age, and of these all, except one, promptly recovered. The youngest was a child of twenty months. My two oldest subjects were, respectively, seventy-three and seventy-seven. Both recovered. Dr. Gilbert, of this city, has performed the lateral operation six times, all his patients being over fifty years of age. The three oldest were, respectively, seventy-four, seventy-eight, and eighty-one, and they all recovered without an untoward symptom.

The condition of the patient's health must necessarily influence the result of the operation. The more perfect this is at the time he is cut, the more likely, other things being equal, will he be to recover, and conversely.

The operation seldom terminates favorably when the stone is unusually large, as when it weighs five, six, or eight ounces, owing to the injury that must necessarily be inflicted upon the bladder, prostate gland, and other structures, often followed by infiltration of urine, erysipelas, phlebitis, and pyemia.

A patient worn out by vesical suffering, or intercurrent disease, as diarrhœa, chronic dysentery, measles, or scarlatina, is a bad subject for an operation, and will be likely to perish from its effects.

Relapse.—When it is considered that most vesical concretions have their origin in the kidneys, or, at all events, that these organs are often cotemporaneously affected, it is not surprising that the disease should occasionally return after operation. What number of cases relapse after being lithotomized, is a point for the determination of which there are no positive data. There is no doubt that it is generally influenced by the nature of the calculous diathesis, and I think it is safe to affirm that persons affected with phosphatic calculi are more prone to suffer a second, and even a third time, than those affected with lithic concretions, or concretions composed of urate of ammonia. Diseases of the urinary organs, or of the digestive apparatus, may be mentioned as predisposing causes of relapse. Indeed, whatever has a tendency to disorder the general health, will be likely to promote the recurrence of the malady. Injuries of the spine, unless promptly relieved, are almost sure to be succeeded by relapse.

The period at which relapse occurs must, of course, depend upon circumstances. Occasionally, it is very short; and, on the other hand, a number of months, and even years, may intervene. As a general rule, the phosphatic and ammoniaco-magnesian calculi are more rapidly reproduced than the lithic and oxalic.

Varieties in the Lateral Operation.—The operation described in the preceding pages is, as has been seen, executed with the knife, and nothing could possibly be more simple. It is the very perfection of lithotomy. Nevertheless, there are some surgeons who prefer the use of the gorget, the lithotome caché or the beaked knife.

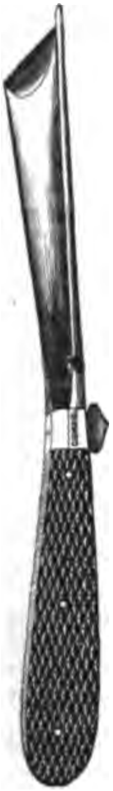
The operation with the *gorget* does not differ, in its early stages, from that with the knife. The period for using the instrument is immediately after the incision of the membranous portion of the urethra. The surgeon then exchanges the scalpel for the gorget, the beak of which is placed in the groove of the staff, guided by the point of the left index-finger. After assuring himself, by drawing the instrument slightly backwards and forwards, that it is in no danger of slipping, he takes hold of the handle of the staff, and, by a simultaneous movement of his hands, he lowers the instrument and the gorget nearly to a level with the abdomen; pushing, at the same time, the latter onward into the bladder. In executing this part of the operation, care should be taken not only that the gorget does not slip out of its place, and thus pass between the rectum and the bladder, but that it is properly lateralized, otherwise there will be great risk of injury to the rectum and the pudic artery. The annexed engraving, fig. 524, represents the gorget as modified and improved by Physick and Gibson.

Instead of the gorget, some lithotomists employ a *beaked knife*, or a probe-pointed bistoury, for dividing the neck of the bladder and the prostate gland. The instrument may be either straight, or somewhat concave on its cutting edge. The one which I generally use, if I use any of the kind at all, is represented at p. 725.

The *single lithotome*, invented, I believe, by Frère Côme, is seldom employed at the present day. The annexed cut, fig. 525, represents the instrument, as modified and improved by Charrière. It will be observed that it has a single blade, moved by a spring, and concealed in a kind of a rod, fixed in a stout handle, and surmounted by a beak, to enable it to slide the more easily and securely in the groove of the staff. The extent to which the blade may be opened is regulated by means of a screw attached to the spring.

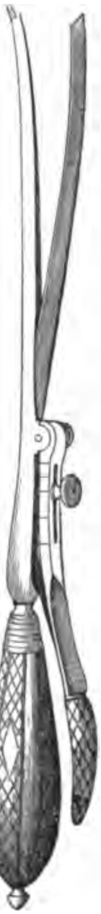
The external incisions having been made in the ordinary manner, and the

Fig. 524.



Physick's gorget.

Fig. 525.



Single lithotome.

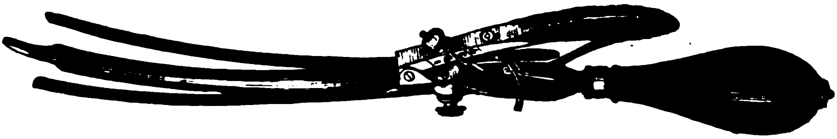
membranous portion of the urethra being fully exposed, the beak of the lithotome is inserted into the groove of the staff, and passed on into the bladder. The blade is then expanded to the requisite degree, and the division of the deep structures effected in withdrawing the instrument, its edge being directed obliquely downwards and outwards, in the long axis of the prostate gland.

Bilateral Operation.—The merit of devising this operation is usually ascribed to Celsus, although it more probably belongs to Le Dran. Its advantages have been prominently set forth in modern times by Chaussier, Béclard and Dupuytren, the latter of whom, having first performed it in 1824, may be said to have regularized and perfected it.

If the bilateral section possesses any advantages over the ordinary method, it must be on the ground of its affording a larger opening for the passage of the foreign body, and that it is attended with less danger to the rectum and the seminal ducts. But even of these the former is, in great degree, counterbalanced by the modern method of dividing the right lobe of the prostate, if the wound in the left be found insufficient for the extraction of the calculus. The operation has sometimes been performed instead of the lateral, on account of difficulty occasioned by malposition of the thigh. It requires the same preliminary measures as the other method. The incisions through the perineum, as far as the groove of the staff, are executed with an ordinary scalpel, and the prostate is divided with a double lithotome caché, seen in fig. 526, a narrow knife, or a probe-pointed bistoury, according to the fancy of the surgeon.

The operation consists in making a semilunar incision across the perineum, beginning on the right side, midway between the tuberosity of the ischium and the margin of the anus, but a little nearer the former than the latter, and terminating at the corresponding point of the opposite side, as seen in fig. 527. The concavity of the cut is directed downwards, and its centre, situated at the raphé of the perineum, is about nine lines above the anus. In this direction are successively divided the skin, celluloadipose tissue, and superficial fascia, together with a few of the anterior fibres of the external sphincter muscle. The end of the left fore-finger is now placed in the bottom of the wound, just as in the ordinary procedure, the staff sought, and the membranous portion of the urethra laid open, by an incision not exceeding four lines. The nail of the finger is then applied to the staff, to serve as a guide to the lithotome, the beak of which is next inserted into the groove of the instrument, with its concavity upwards. Taking care, by moving the lithotome several times forwards and backwards, that it is securely lodged in the groove, the sur-

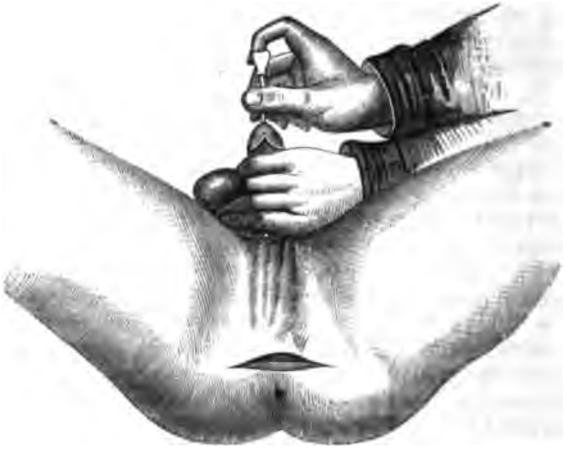
Fig. 526.



Double lithotome.

geon seizes the handle of the staff, and depresses it nearly to a level with the abdomen, at the same time that he lowers the lithotome, and pushes it onward into the bladder. As soon as the instrument has reached the viscus it is turned round with its concavity towards the rectum, and while it is in this position it is withdrawn, its blades being expanded by pressing their springs. In this manner it cuts its way out, slowly and steadily, dividing in its retrograde course the sides of the prostate, in a direction obliquely downwards and outwards, as in the ordinary section. The finger now takes the place of the instrument, the situation of the stone is ascertained, the forceps are introduced, and extraction is effected in the usual manner.

Fig. 527.



Bilateral operation.

No statistics have yet been furnished, on an enlarged and reliable scale, of the results of this operation. In the posthumous work of Dupuytren, who introduced this method into France, and who imparted to it much of its present perfection, is a table comprising 89 cases, of which 19 terminated fatally, making an average mortality of 1 in $4\frac{13}{19}$. It is proper to add that four of these cases occurred in females, who all recovered.

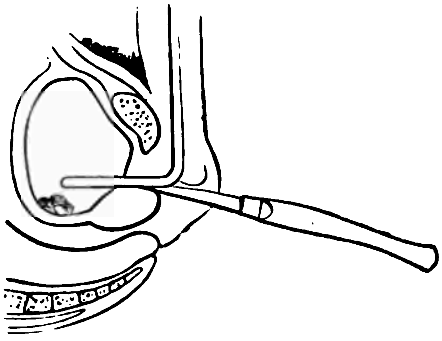
Of 118 cases of this operation by American surgeons, as Mussey, Spencer, Eve, Stevens, Parker, and others, 105 recovered, and 13 died, showing a mortality in the proportion of 1 to $9\frac{1}{13}$. If, to these cases, we add those of Dupuytren, we shall have an aggregate of 207 cases, with 32 deaths, or a loss of 1 in $6\frac{15}{32}$.

Median Operation.—Attention has recently been directed to this operation by Professor Rizzoli, of Italy, who, at the date of his publication, had performed it eight times, and in every instance successfully. As the name indicates, it consists in opening the bladder at the raphé of the perineum, which, as a preliminary step, is rendered as prominent as possible by means of a curved staff.

It is not difficult to conceive that this operation might answer admirably in cases of small calculi, while it might be very objectionable in large ones, on account of the inadequacy of the wound, which is comparatively diminutive. It certainly possesses the advantages of freedom from hemorrhage and from injury to the rectum and seminal vesicles.

Medio-Lateral Process.—Professor Buchanan, of Glasgow, proposed, some years ago, to enter the bladder along the median line by means of a *rectangular staff*, with the groove on the left side, and a straight, narrow knife, with a long edge, shaped at the point like a scalpel, but fitted to stab as well as to cut. The staff, introduced into the bladder, is moved backwards and forwards, over the left index-finger in the rectum, until the prominent angle is distinctly perceived in the perineum, at the anterior verge of the anus, or at that portion of the raphé where the skin and mucous membrane are insensibly blended with each other. The instrument is now confided to an assistant, with a request to maintain it firmly in its position, with the handle inclined towards the abdomen. The surgeon, holding the knife horizontally with the edge towards the left side, as in fig. 528, penetrates the skin and other tissues of the perineum until the point is partly in the groove of the staff, when he conducts it directly onwards until it reaches the bladder, a circumstance which is always indicated by the escape of a few drops of urine. Withdrawing the knife from this position, he now carries it obliquely downwards and outwards, for three-quarters of an inch, in the direction of the forepart of the tuberosity of the ischium, and then finishes by cutting, for three-eighths of an inch, almost vertically downwards. If the wound is not sufficiently spacious to admit of the easy extraction of the calculus, it may afterwards be enlarged to any desired extent.

Fig. 528.



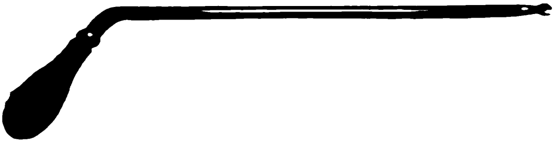
Lithotomy with the rectangular staff.

The advantages which Dr. Buchanan claims for this procedure are, 1st, that it is more easily and rapidly executed than the ordinary lateral one; 2dly, that it is less severe, because of the less extensive division of the parts; and, 3dly, that it is not attended with so much risk of hemorrhage, of injury to the rectum, and of urinary infiltration. It appears from recent statistics that, of 52 operations for stone, performed according to this method, by Dr. Buchanan and Dr. Lawrie, in the Glasgow Infirmary, 47 recovered, and 5 died, thus showing a mortality in the proportion of 1 to 10.4.

Lithectasy.—Perineal lithotomy is occasionally combined with dilatation, a process constituting what may be denominated lithectasy, the object being to make a small opening in the first instance, which may afterwards, if necessary, be increased by pressure. The operation was originally suggested by Manzoni, of Verona, early in the present century, and has recently been warmly advocated by Dr. de Borsa, who seems to prefer it to every other expedient, on the ground of its freedom from hemorrhage and urinary infiltration, as well as the rapidity with which it may be executed, a single minute usually sufficing for its completion. The only instruments required are a staff, a bistoury, and a pair of forceps. Having made an incision through the raphé of the perineum, de Borsa opens the whole of the membranous portion of the urethra, so as to expose the staff to the extent of about ten lines; when, laying aside his knife, he at once passes the left index-finger into the bladder, along the right side of the instrument, and then, by a semi-rotatory movement of the member, gently and cautiously conducted, he dilates the prostatic portion of the tube and the neck of the bladder sufficiently to enable him to introduce the forceps and extract the calculus. The operation is, of course, applicable only to small calculi.

A modification of this operation has been devised and successfully practised by Mr. Allarton. It consists in making an incision, with a long, straight bistoury, directly through the raphé of the perineum, about six lines above the verge of the anus, down upon a curved staff with a central groove, the instrument being previously hooked against the pubic symphysis, and well steadied by the left index-finger in the rectum. The knife, after having reached the staff, is carried a little towards the bladder, but not into it, when it is withdrawn, enlarging, as it retraces its steps, the external opening towards the scrotum, so as to make it altogether from an inch to an inch and a half in length. The operator then, inserting into the bladder a probe surmounted with a bulb, removes the staff, and expands the wound with the forefinger of the right hand. If the stone it small, it will now probably fall into the wound, and be forced down partly by the stream. Should this fail, the finger is again used, its power increased by the addition of an India-rubber stall, until the dilatation has been carried to the required extent. If the calculus is rather large, it may be [illegible] The instrument seen in fig. 529 represents the staff devised by Dr. Little for perform-

Fig. 529.



Dr. Little's staff.

ing this operation. It is questionable whether it possesses any advantage over the ordinary instrument.

Recto-Vesical Operation.—The recto-vesical operation, as devised in 18[illegible] by Sanson, of Paris, is already obsolete. It consists, as the name implies, in cutting into the bladder through the rectum, perineum, and prostate gland. It has been abandoned on account mainly of its liability to be followed by extensive suppuration of the cellular tissue within the pelvis, injury of the ejaculatory ducts and seminal vesicles, and lastly, though not least, stercoraceous fistule, difficult, if not impossible of cure.

A modification of this operation was successfully performed upon a man aged twenty-six, in 1859, by Dr. Lewis Bauer, by opening the rectum just above the prostate, the canal having previously been expanded with a duck-bill speculum. The calculus, weighing an ounce and a half, was extracted with some difficulty. The wound was accurately closed with five silver sutures, which were removed on the eighth day, the union being perfect.

In a case operated upon, in 1860, by Dr. Noyes, the wound, made through the central portion of the prostate, and enlarged bilaterally, was closed with metallic sutures, supported by a leaden button. The apparatus was removed on the twelfth day, the parts being entirely healed, except at one little point which afterwards cicatrized under the application of nitrate of silver.

Supra-Pubic Operation.—In the supra-pubic, hypogastric, or high operation, the bladder is opened above the pubes, in the direction of the linea alba. Its chief advantages are, that it is free from hemorrhage; that it does not expose the patient to injury of the rectum and the ejaculatory ducts; that there is no risk from inflammation of the neck of the bladder; that it may be performed where the lateral section is impracticable; and, lastly, that it admits of the most easy removal of a large, attached, or encysted calculus. As an offset to these advantages, it is to be remarked that the procedure is liable to be followed by injury of the peritoneum, and by urinary infiltration, not to say anything of the difficulty of executing it when the abdomen is loaded with fat, or the bladder does not ascend any distance above the pubes. The latter of these dangers may, however, in general, be avoided by premising a perineal puncture, to serve as an outlet to the urine, which thus drains off as fast as it reaches the neck of the bladder. The former, too, may usually be guarded against, if the precaution be used, first, to distend the bladder thoroughly before the operation, and, secondly, to push the peritoneum gently before the knife, after cutting through the inferior part of the linea alba.

In performing the *operation*, the patient is placed recumbent upon a narrow table, with the legs hanging loosely over its lower edge, and the feet resting upon a high chair. The head and shoulders are somewhat elevated, to relax the abdominal muscles. The bladder, if not previously distended by its own contents, is now filled with tepid water until it rises a considerable distance above the pubes. The surgeon, standing on the left side of the patient, makes an incision from three and a half to four inches in length, commencing at the pubic symphysis, and extending upwards towards the umbilicus, in the direction of the linea alba. It should pass through the skin and cellulo-adipose substance, down to the aponeuroses of the abdominal muscles. These structures, being thus exposed, are next cautiously divided to the same extent, any bleeding vessels being at once secured.

The bladder will be found at the bottom of the wound, forming a tolerably large, fluctuating tumor, invested merely by a thin layer of cellular tissue. To divide this, a few gentle touches of the knife are sufficient; or, what is better and more safe, the dissection may be effected with the steel end of the handle of the instrument. If the bladder is not sufficiently prominent, it should be rendered so by the introduction of a sound through the urethra. In either case, it is a matter of paramount importance to secure the organ with a tenaculum before it is incised, in order to prevent it from collapsing, and so sinking down behind the pubic bones; an occurrence which could not fail greatly to embarrass the subsequent steps of the operation. A puncture is next made into the anterior surface of the viscus, on a level with the pubic symphysis, large enough to admit the index-finger of the left hand, which is at once inserted, and used as a searcher, to ascertain the situation and volume of the stone. The opening is afterwards enlarged, with a probe-pointed bistoury, to any extent that may be required; the forceps are introduced, and the stone is seized and removed. A short silver tube, carefully rounded at the end, and pierced with numerous apertures at the sides, is now conveyed into the bladder, at the lower part of the wound, and secured by two pieces of tape fastened to a broad roller, the edges of the remainder of the opening being previously approximated by several points of the twisted suture, aided by adhesive strips.

Instead of the above procedure, which is often attended with much inconvenience and risk, the best plan is to close the wound in the bladder accurately by suture, introduced in such a manner as not to interfere materially with the serous investment of the organ. The operation, which was first practised by Professor Bruns, of Tübingen, ought, in my judgment, to supersede the ordinary and more hazardous procedure.

The supra-pubic operation was first performed, in this country, by Professor Gibson, of this city, his patient, an old man, dying in a few days of peritonitis, the effect of urinary effusion. It was repeated, not long after, by Dr. Carpenter and Dr. McClellan. Of late years, it has been resorted to in numerous instances by some of our other sugeons, but not, on the whole, with any gratifying results. The largest calculus ever removed by this method weighed upwards of two pounds, its length being nearly seven inches, its breadth four inches, and its thickness nearly two inches and a half. It was of a gourd-like figure, rough on the surface, and accurately moulded to the shape of the bladder, which was greatly indurated and hypertrophied. The patient, who was thirty-nine years of age, died on the eighth day of inflammation. The operator was Professor Uytterhoeven, of Brussels.

The most reliable *statistics* of the supra-pubic operation are those given in my Treatise on the Urinary Organs, comprising 180 cases, of which 39, or 1 in 4⅗, proved fatal. The principal causes of death were peritonitis and urinary infiltration. Frère Côme lost 19 cases out of 100, and Souberbielle 11 out of 39. Mr. Humphry, of England, lately collated the particulars of 104 cases of this operation, of which 31 proved fatal, or 1 in 3⅓.

Inguinal, Scrotal, and Labial Lithotomy.—A urinary calculus is occasionally situated on the outside of the pelvis in a prolapsed bladder. The affection is most common in the groin, but instances have occurred in which the concretion descended into the scrotum, the sciatic notch, the labium, or even the perineum, as in the remarkable case related by Hartmann. The tumor which is thus formed may be of considerable bulk, especially when it is complicated with hernia of the bowel, and is either of very firm consistence, or soft at one point, and hard at another. Sometimes the stone is lodged partly within and partly without the pelvis.

The symptoms of extra-pelvic calculus do not differ materially from those which attend ordinary vesical calculus. The urine is voided with great difficulty, more or less pain is experienced, and little satisfaction is afforded by sounding.

In general, the foreign body may readily be detected with the finger; when a number of concretions exist, a distinct crackling noise may occasionally be elicited by rubbing them against each other.

The proper treatment in these different forms of calculus consists in cutting down upon the foreign substance, through the coats of the prolapsed bladder, as it lies in its abnormal situation, in effecting extraction with the finger, scoop, or forceps, and in retaining a catheter in the bladder until the wound is nearly healed, lest urinary infiltration should occur. When the concretion projects by its larger extremity into the pelvis, it may be necessary to perform the lateral or supra-pubic operation, as riddance by direct incision will then probably be impracticable.

GENERAL RESULTS OF THE DIFFERENT METHODS OF LITHOTOMY.

The following table presents the general results of the more important operations described in the preceding pages.

Methods.	Cases.	Cures.	Deaths.	Ratio of deaths.
Lateral operation	5418	4829	589	1 in $9\frac{1}{5}$
Bilateral method	207	175	32	1 in $6\frac{15}{32}$
Recto-vesical section	83	67	16	1 in $5\frac{3}{16}$
Supra-pubic operation . . .	180	141	39	1 in $4\frac{8}{13}$
Total	5888	5212	676	1 in $8\frac{5}{7}$

STONE IN THE BLADDER OF THE FEMALE.

Women are much less liable to urinary calculi than men. The period of life at which they are most prone to suffer is from the twentieth to the fiftieth year. The symptoms which attend the affection, and the effects occasioned by it, are similar to those which characterize it in the other sex.

Stone in the female forms more frequently than in the male upon foreign bodies, either developed there or introduced from without. Dr. James Morton, of Scotland, has published the particulars of a case in which he removed, by the lateral operation, from a woman forty-seven years of age, three calculi and a bone, evidently the sequelæ of an extra-uterine conception.

In sounding, the patient is placed upon her back, on the edge of the bed; and the instrument, a short steel rod, slightly curved at the extremity, is carried about through the interior of the bladder, so as to explore, if necessary, every recess of this organ. In young children, the finger may, if deemed advisable, be inserted into the rectum; but in grown subjects it is always best to introduce it into the vagina.

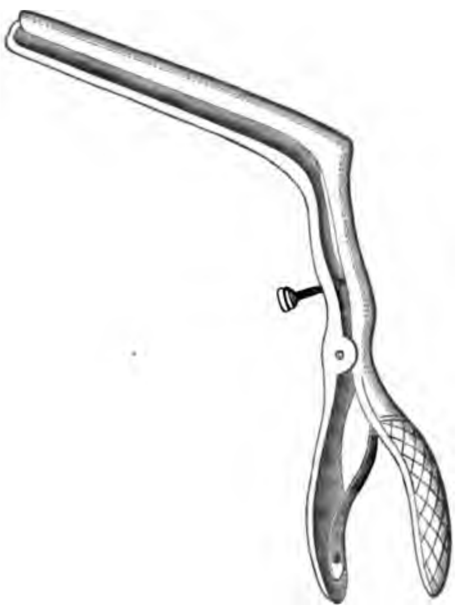
Quite a number of cases are upon record in which calculi of large size were spontaneously expelled from the female bladder. The extrusion is sometimes effected suddenly, but, in general, it is accomplished slowly, and with more or less pain and difficulty in voiding the urine. Dr. Walter F. Atlee recently showed me a rough, ovoidal calculus, three-quarters of an inch in its smallest diameter, voided by a woman, forty-five years of age, after it had been detained in the urethra for four hours. A little effort with the finger was necessary to complete the extrusion. Slight incontinence of urine followed, but disappeared in a very short time. Cases of the spontaneous expulsion of stones, weighing from two to twelve ounces, have been recorded by Callot, Molyneux, Yelloby, Middleton, Klander, and others.

A vesical calculus is sometimes discharged through the vagina, in consequence of ulceration of the vesico-vaginal septum. In a case of this kind, mentioned to me by Dr. Dunlap, of Norristown, a woman, aged sixty-seven, after eight days of intense suffering, was rid in this manner of a stone weighing three ounces, and measuring upwards of three inches in its long diameter. It was of an ovoidal shape, of a lamellated structure, and of a phosphatic character. For some time most of the urine passed off at the abnormal opening, and nearly twelve months elapsed before it fully resumed its natural route. Two years and a half afterwards, Dr. Dunlap removed two small calculi with the forceps. The woman is now seventy-five years of age, and there is still slight dribbling of urine when she is in the erect posture.

The common plans of operation, for the removal of stone from the female bladder, are dilatation of the urethra, crushing, and incision.

The method by *dilatation* is liable to be followed by incontinence of urine, in consequence of which it has of late years fallen very much into disrepute. It is more particularly adapted to small concretions, unaccompanied by any serious disease of the urethra and the neck of the bladder. The dilatation may be effected slowly or rapidly, by means of instruments especially contrived for the purpose, as the one sketched at fig. 530, or by sponge tents, bougies, or catheters. I commonly use the latter, especially at the beginning, and one of gum is preferable to one of silver. When the stone is small, the necessary dilatation may be effected in a few hours, or, at all events, in a few days.

Fig. 530.

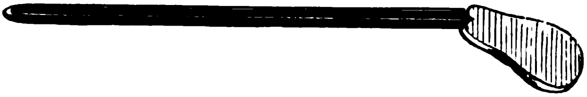


Urethral dilator.

Crushing may be employed when the stone is comparatively soft, and yet so large as to render it impossible to extract it without undue dilatation of the urethra. The object may be effected either with a small pair of lithotomy forceps, rather narrower than common in the blades, or with any of the ordinary lithotriptors.

The operation of *lithotomy* is easy of execution, perfectly free from danger of hemorrhage, and not liable to be followed by incontinence of urine. The only instruments which are required for its performance are a straight staff, five inches in length, and a straight probe-pointed bistoury. The staff, fig. 531, being introduced, an incision is made directly upwards towards the pubic symphysis, extending through the urethra and the neck of the bladder, in their entire length. The opening may afterwards, if necessary, be dilated with the finger to almost any extent that may be required for the safe and easy extraction of the calculus. When the concretion, however, is of unusual magnitude, and cannot be thus removed, the incision may be extended downwards and outwards towards the tuberosity of the ischium.

Fig. 531.



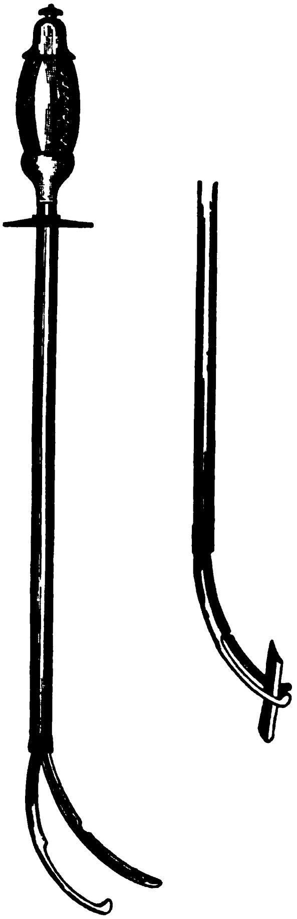
Female staff.

A modification of the above operation, consisting of dilatation and incision, may sometimes be advantageously employed. After dilatation has been practised to a sufficient extent to admit the index-finger, the tube is divided in one half of its length, either anteriorly or posteriorly, according to the judgment of the surgeon. The great object of this procedure is to prevent incontinence of urine.

A stone has sometimes been extracted through an incision in the anterior wall of the vagina, constituting what is called *vesico-vaginal lithotomy.* The operation, originally performed by Rousset, is extremely easy of execution, but, inasmuch as it is liable to be followed by fistule, it cannot be too pointedly condemned. Should the necessities of the case render such interference indispensable on account of the large size of the calculus, or the presence of disease in the vulva, the edges of the wound should immediately be approximated by wire sutures.

FOREIGN BODIES IN THE BLADDER.

Fig. 532. Fig. 533.



Forceps for extracting foreign bodies from the bladder.

The foreign bodies that may find their way into the bladder are too diversified in their character to admit of any very precise enumeration. The most common, however, as well as the most important, are balls, pins, needles, fragments of bone, pieces of straw, or other vegetable substances, and bits of catheters and bougies.

Such bodies may be introduced into the bladder either accidentally, or they may be thrust up designedly, but with no intention of leaving them in this unfortunate situation. However this may be, the effects upon the foreign substance and the bladder are generally similar, or, at any rate, if they differ at all, they differ only in a very slight degree. The extraneous body usually becomes speedily incrusted with earthy matter, sometimes attaining a large bulk in a few months.

Foreign bodies, introduced into the bladder, occasionally perforate its wall, and, escaping into the peritoneal cavity, excite fatal inflammation. The likelihood of such an occurrence will, of course, be greatly influenced by the form and consistence of the extraneous substance.

The extraneous body, if small, may be expelled spontaneously; but, generally speaking, it must be extracted by operation. A bullet of ordinary size might be removed simply by dilating the urethra; or, this failing, by Cooper's forceps. When the foreign body refuses to come away of its own accord, or the forceps are unavailing, relief must be attempted by the lateral operation.

The records of surgery abound in instances in which bits of gum-elastic catheters and bougies were extracted from the bladder by means of forceps, an excellent pair of which is represented in figs. 532 and 533. When the foreign body is a pin or needle, it may sometimes be entrapped in the eye of a catheter, as in the memorable case of La Motte.

SECT. III.—DISEASES AND INJURIES OF THE URETHRA.

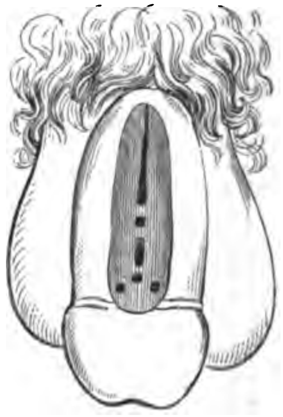
MALFORMATIONS.

The urethra is liable to a variety of malformations, which, though exceedingly rare, ought, nevertheless, to be well understood, on account of their great practical importance, and the sad effects which they exert upon the happiness of the poor sufferer. The most common of these congenital vices are, first, closure or contraction of the meatus; and, secondly, absence, contraction, and change of form of the urethra.

The external orifice of the urethra occasionally deviates from its normal situation, lying much higher up or lower down than usual; and there are cases where it is either extremely small, or altogether occluded, thus interfering more or less completely with the passage of the urine. I have seen several instances of double meatus, in neither of which, however, more than one opened into the urethra, the other ending in a blind pouch.

The urethra may be absent, as is exemplified in extrophy of the bladder, in which both the urine and semen are discharged above the pubes. Authors have described what they call a double urethra, but of such a malformation no well authenticated case has ever been reported. Sometimes the canal is bifid or cleft, forming a kind of gutter, running along the dorsal surface of the penis, and constituting what is denominated *epispadias*, as seen in fig. 534. Occasionally, again, it is deficient in front, but well formed behind, terminating, however, always in a narrow orifice, admitting of an imperfect discharge of the urine. It is to this variety of malformation that the term *hypospadias* has been applied.

Fig. 534.



Epispadias.

Some of these defects are, of course, irremediable; others, however, admit of relief, though generally not without great difficulty.

Occlusion of the external meatus always demands prompt interference. When it is caused simply by a duplicature of the lining membrane, forming a sort of hymen, a vertical incision in the direction of the natural outlet is generally all that is required; the edges of the wound being kept asunder by means of a bougie. When the imperforation depends upon the presence of fibrous tissue, and reaches a considerable distance back, the operation will be more serious, and will require to be performed with a trocar.

Hypospadias and epispadias are defects of a serious character, which, besides greatly inconveniencing their unhappy subjects, often serve as causes of impotence.

Hypospadias presents itself under three varieties of form, of which the most common, as well as the most simple, is the one in which the urethra opens just behind the frenum. In the second, the tube opens at some point intermediate between the first and the scrotum; and in the third, the urethra terminates at the latter organ, which is cleft at the middle line.

In the more simple variety of hypospadias, a cure may be attempted by paring the edges of the fissure and uniting them by means of interrupted sutures over a catheter introduced into the bladder. Any part that may remain unclosed may be touched with nitrate of silver.

The same mode of proceeding is adopted when the fissure exists further back, only that it will be necessary, in addition, to establish an artificial urethra by means of a trocar, pushed in the direction of the natural channel. The canal is kept pervious by a catheter, until it has received a mucous lining, after which the instrument should be worn a few hours every day for a number of months.

The treatment for *epispadias* is conducted upon the same principle as that for the different varieties of hypospadias just described. In a case under Mr. Liston, in which nearly four inches of the urethra were exposed, a complete cure was effected in a few days. The operation consisted in paring the edges of the cleft thoroughly, and putting them together over a catheter, by means of many points of the twisted suture. Union by the first intention took place in the entire track, except near the pubes, where a very minute fistulous opening remained, through which not more than a drop of urine oozed during micturition.

This was afterwards closed with a heated needle. The organ was, i · spects, and for all purposes, as perfect as could be desired.

LACERATION.

The urethra is liable to laceration by causes acting either from withou or within. Under the first head may be comprised falls, blows, and kicks up: perineum, or the perineum and penis; under the second, injury done b lodgment of a calculus, the violent straining which attends micturition a ture, and the rude, forcible, or injudicious use of catheters, bougies, and s

Laceration of this canal occasionally takes place under a violent e especially if the penis, while in this condition, happens to be struck acci against a hard, resisting body. The accident has also been known to during convalescence, after attacks of fever. The rent may be limited t mucous membrane, or it may involve along with it all the tissues which vene between the canal and the external surface.

The *symptoms* are generally sufficiently characteristic. The most pr are, pain in the affected part, hemorrhage, inability to void the urine, o discharge of this fluid in a small and imperfect manner, discoloration perineum, or of the perineum, scrotum, and penis, and great difficulty, utter impossibility, of introducing the catheter. The patient is weak an perhaps sick at the stomach, and labors under all the effects of a severe s

The *treatment* must be prompt and decisive, as there is great danger o tration of the cellular tissue of the perineum and scrotum, from the ex the urine. If the rent is small, the first thing to be done is to pass a ca into the bladder, one being selected that is rather over than under the or size. If, on the contrary, the injury is very extensive, or, if some hours elapsed since its occurrence, and the symptoms indicate urinary infiltra time is to be lost in making numerous and deep incisions into the affected In conjunction with this treatment, local bleeding, purgatives, the warm anodynes, fomentations, and poultices may be advantageously employed.

HEMORRHAGE.

Hemorrhage of the urethra, although uncommon, is always alarming patient, and often a source of much embarrassment to the practitioner. It present itself under two varieties of form, the spontaneous and the traum which the latter is the more frequent.

Spontaneous hemorrhage is met with chiefly in elderly and middle-ag sons, who have led a life of irregularity and debauch. It occasionally during a violent erection of the penis.

Traumatic hemorrhage, on the contrary, usually depends upon direct v as, for instance, that caused by the passage of a urinary concretion, the duction of instruments, or attempts to force a stricture. It is a very c consequence of injury of the perineum. The bleeding, however indu seldom copious.

Hemorrhage of the urethra rarely requires surgical interference; in cases it either ceases spontaneously, or it is easily arrested by repose horizontal position upon a hair mattress, by iced drinks, and by pressure few minutes, upon the perineum, directly opposite to the part from whi blood proceeds. A cold enema sometimes puts a sudden stop to it. C astringent injections into the urethra, thrown high up, are also beneficial. If the case is obstinate, compression may be made by means of a large ca introduced into the bladder, and supported with a bandage, a fing adhesive strips. The most efficient internal remedies are gallic acid and acetate of lead, in combination with opium. Alum, given in large doses, i useful. In very obstinate cases, recourse may be had to spirits of turp and the tincture of the chloride of iron, in doses of ten drops each, rep every hour.

FOREIGN BODIES.

Foreign bodies in the urethra may be arranged under two heads: 1st, those which descend from the urinary bladder, or which are developed in the canal itself; and, 2dly, substances forced into the urethra through its natural orifice.

1. *Foreign Bodies which descend from the Bladder, or are developed in the Urethra.*—Most of the substances which descend into the urethra from the bladder, are simply earthy concretions, which are developed either in the latter organ, in the prostate gland, or in the kidneys. Sometimes, however, they consist of articles which were originally admitted through the urethra, and which have afterwards, in consequence of the force impressed upon them by the bladder in micturition, taken a retrograde course. The concretion may be developed in the urethra itself, but this is rare.

The passage of a calculus from the bladder along the urethra is frequently productive of great inconvenience and distress. The intromission is generally sudden and unexpected, taking place while the patient is engaged in micturition. It is instantly followed by an interruption of the stream of urine, an urgent desire to empty the bladder, severe straining, more or less pain, and a sense of burning or tearing in the urethra. If the substance is small, it may be expelled in a few minutes; if, on the contrary, it is disproportionately bulky, it may be permanently arrested, and give rise to severe suffering, accompanied by retention of urine, painful erections, and probably, also, by slight hemorrhage from laceration of the mucous membrane.

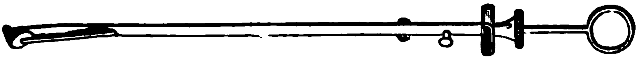
The *symptoms* which attend the passage of a calculus along the urethra may be simulated by those produced by other causes; therefore, to establish the diagnosis it is necessary to institute a careful examination with the finger and the catheter. When the substance is situated far back, as in the membranous or prostatic portion of the urethra, the exploration must be conducted with the finger in the rectum. In using the catheter, care should be taken that the substance is not pushed back into the bladder. It is worthy of remark that, when the calculus has escaped from the urethra and lodged in the subjacent structures, the instrument may fail to detect it, even when it is of large size.

A calculus, after having remained in the urethra for an indefinite period, sometimes effects its own expulsion by exciting absorption, and, finally, ulceration of the surrounding tissues.

When the foreign body is lodged in the posterior portion of the tube, and obstructs the flow of urine, the safest plan is to push it back into the bladder; whereas, if it is comparatively small, or unusually rough, it should be removed. Before doing this, however, an attempt should be made to favor its expulsion by dilating the urethra. Occasionally extrusion may be effected by injections of sweet oil, or by closing the prepuce, and holding it tightly while the patient is making a powerful effort at micturition, at the same time that pressure is applied along the under surface of the urethra, to urge on the foreign body.

When the calculus occupies the spongy portion of the tube, it ought to be extracted, whatever may be its size or form, provided it cannot be extruded during micturition. When it is situated near the orifice of the urethra, it may be removed with a pair of narrow-bladed dissecting forceps, but when it lies far back in the canal, a wire-loop, as originally suggested by Marini, may be used. The only objection to this instrument is the difficulty of passing it behind the concretion, which, when large enough to lodge, usually fills up the entire passage.

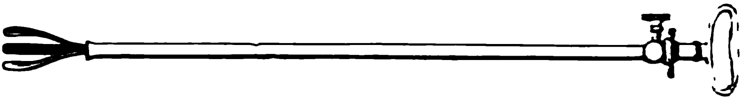
Fig. 535.



Bonnet's articulated scoop.

When these simple means fail, recourse must be had to the urethral forceps, of which there is a great variety. The one to which I give the preference is the articulated scoop, fig. 535, of Bonnet, of Lyons, but it is applicable only to small substances. It is armed with a stylet, and is furnished with a for seizing and fixing the foreign body. The instrument, well oiled, is br contact with the concretion, when its blades are expanded over it, and effected in the most slow and gentle manner, to prevent injury of the membrane. Fig. 536 represents Hunter's forceps, as improved by geons, for removing urethral calculi.

Fig. 536.



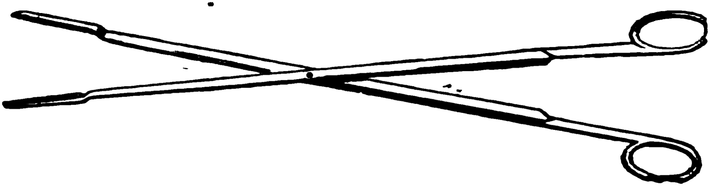
Hunter's forceps.

Crushing is applicable only when the calculus is soft and friable: but as can hardly ever be known beforehand, it is rarely available. The op moreover, is seldom safe.

Excision, which becomes necessary when extraction fails, varies accord the situation of the foreign body. When the concretion is lodged in the p tatic or membranous part of the tube, it is performed very much after the of Celsus, in cutting on the gripe, the left index-finger being inserted in rectum, to protect the tube from harm, and a small incision being made direction of the raphé of the perineum.

When the calculus is impacted in the navicular fossa, or even farther back extraction may generally be easily effected with the forceps represented 537. Or, this failing, an incision may be made over it, along the lower p the urethra, where this tube corresponds with the head of the penis.

Fig. 537.



Forceps for extracting calculi from the urethra.

When the foreign body lies in that portion of the urethra which corresp with the scrotum, incision should be practised with great caution, from the that it is liable to be followed by infiltration of urine, and all the bad con quences of this accident. In such a case, I would advise immediate cau tion of the wound with nitrate of silver, to favor the deposit of lymph, and avoidance of micturition until the parts have become fully consolidated. instead of this, an incision might be made through the skin and cellular over the tumor, and the wound stuffed with lint. The requisite amount of flammation having been excited, the operation is completed by dividing the parietes of the urethra in the usual manner.

2. *Foreign Bodies introduced from without.*—Of foreign bodies introdu into the urethra from without, the number and variety are quite considera The occurrence is sometimes fortuitous, but more frequently it takes place thro design. Bits of catheters, bougies, quills, pipe-stems, wood, straw, and other stances, have been accidentally lodged in the urethra, by individuals endea to draw off their urine, relieve a stricture, or provoke onanism.

Foreign bodies, introduced into the urethra from without, have a great ency to pass into the bladder, owing to the suction power of this organ. frequently, however, they become impacted in the tube, and they may then, they are situated very far back, be usually readily extracted with a pair of delicate forceps, such, for instance, as those represented in fig. 532.

MORBID SENSIBILITY.

This affection consists mainly, if not exclusively, in an exaltation of the natural sensibility of the mucous membrane of the urethra. It is quite frequent in both sexes, but is much more common in men than in women.

It is not always easy, or even possible, to ascertain the nature of the exciting *causes* of this affection, so diversified are they in their character. In the male it is often dependent upon the effects of gonorrhœa and gleet, stricture of the urethra, and enlargement of the prostate gland; and, in both sexes, upon disorder of the bladder, kidneys, ureters, anus, and rectum. Morbid sensibility of the urethra sometimes attends inflammation, ulceration, and other derangement of the uterus, vagina, and vulva. A morbid state of the urine may not only induce it, but maintain it for an indefinite period. Of all the causes, however, onanism and inordinate sexual indulgence are, there is reason to believe, the most common.

The *symptoms* of this disease are subject to great diversity, both as it respects their nature and degree. In the more simple forms, there is merely an exaltation of the normal sensibility of the mucous membrane. When the affection is more fully developed, the local distress is not only more severe but often extends to the surrounding parts, as the perineum, groin, anus, pubes and genital organs. The bladder also suffers sometimes sympathetically, and at other times from a positive extension of the disease. Occasionally the symptoms resemble those of stone in the bladder. When the disease exists in this aggravated form, there is always marked disorder of the general health When the posterior portion of the tube is involved, seminal emissions are apt to take place. The urine is variously altered in its properties; in general, it contains an undue quantity of mucus, and not unfrequently it exhibits, under the microscope, different deposits, especially oxalate of lime and phosphates.

The best mode of determining the precise nature of this disorder is the introduction of the catheter. One of medium size is selected, and is passed with the greatest care and gentleness. By this means we are able to ascertain the extent and degree of the sensibility, and also whether there is stricture of the urethra, enlargement of the prostate gland, or disease of the bladder. It should be remembered that the healthy urethra is often extremely sensitive on the first introduction of a catheter.

The true *pathology* of this disease is not accurately determined. There is no doubt that it is occasionally caused by inflammation, either subacute or chronic in its character; but very frequently it appears to be owing merely to an exaltation of the normal sensibility of the mucous membrane.

In the *treatment* of this affection, one of the first objects should be to find and remove the exciting cause. In general, marked relief will follow the use of antiphlogistics, assisted by the exhibition of bicarbonate of soda, either alone or in union with uva ursi and hop-tea, mild laxatives, and anodyne injections, with the addition of a small quantity of acetate of lead, Goulard's extract, sulphate of zinc, or nitrate of silver. The general health should be attended to. The introduction of a full-sized catheter, at first once and afterwards twice a day, will sometimes be productive of the best results. In this way, moreover, the affected surface may be directly medicated; the dilute ointments of nitrate of mercury and belladonna are, especially if used in combination, entitled to the first rank in the list of this class of remedies. When there are involuntary seminal emissions, hardly anything short of cauterization of the prostatic and membranous portions of the urethra will be likely to succeed. Whatever mode of treatment be adopted, the patient should refrain from sexual indulgence and exercise on horseback.

The best internal remedy, when there is no appreciable local cause for the disease, is, on the whole, the bromide of potassium, given in solution, in doses varying from eight to ten grains three times a day. It seems to act as a [illegible]tive, and to make a direct impression upon the affected parts.

NEURALGIA.

It is not surprising that the excretory canal of the urine should be [illegible] neuralgia, especially when we consider its structure and functions, and [illegible] sources of irritation to which it is subject. The disease is most [illegible] after the age of puberty, in persons of a nervous excitable temperament [illegible] much more frequent in males than in females.

Its origin is generally obscure. It may be caused by external injury, [illegible] or frequent sexual intercourse. It is sometimes dependent on a miasmatic [illegible]pregnation of the system.

The pain is of a sharp, pricking character, darting about in different [illegible] with the rapidity of lightning; it often remits or intermits for a few [illegible] and then recurs with its former violence; it is generally attended with [illegible]able soreness of the urethra and penis, a frequent desire to micturate, [illegible]ing in voiding urine. In some cases the disease is periodical.

The *treatment* is to be conducted upon the same principles as that of [illegible] in other parts of the body. The cause is, of course, if possible, remo[illegible] which recourse is had to quinine, arsenic, strychnia, and aconite. W[illegible] affection is of a purely miasmatic origin, no other treatment is generally [illegible] In the milder forms of the disease, quinine alone will often speedily [illegible] cure. In obstinate cases, valerianate of iron sometimes succeeds when [illegible] remedies fail.

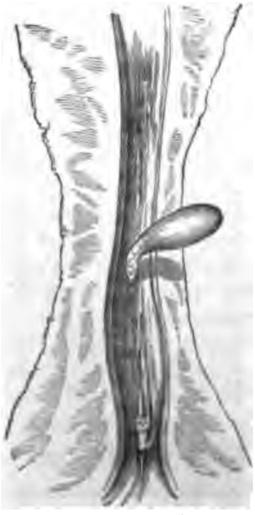
Little is necessary in the way of local treatment. During the parox[illegible] penis may be immersed in warm water, or fomented with hot cloths im[illegible] with laudanum. Veratria and belladonna ointment is occasionally [illegible] In some cases I have witnessed good effects, especially in cold weather [illegible] making the patient constantly carry his penis in a thick flannel stall to [illegible] it from atmospheric vicissitudes. It need scarcely be said that all [illegible]course should be avoided.

POLYPOID TUMORS.

These tumors occur in both sexes, and in different portions of the urethra [illegible] the male, the most common site is the anterior [illegible] the tube, just behind the urinary meatus. In [illegible] they are also generally situated superficially, [illegible]times projecting beyond the external orifice [illegible] urethra.

In the male, these growths are generally small [illegible] volume rarely exceeding that of an apple-seed. [illegible] are of a soft, spongy consistence, of a red color, [illegible] a pyriform, conical, or spherical shape, their attac[illegible] being usually by a small pedicle. In general, th[illegible] solitary, but I recollect one instance in which there [illegible] not less than three, situated close together. [illegible] surface is sometimes perfectly smooth, at other[illegible] slightly granulated, rough, or studded with villi. In regard to their structure, they consist of a f[illegible] or cellulo-vascular substance, invested by a prolon[illegible] of the lining membrane of the urethra. A goo[illegible] of this variety of morbid growth is afforded by fig [illegible] from Thompson.

Fig. 538.



Polyp of the urethra.

These polypoid tumors are generally free from [illegible] in which respect they differ remarkably from the [illegible]cular growths in and around the female urethra. [illegible] are usually attended by a thin, gleety discharge.

they seldom materially obstruct micturition. Their development is tardy and insidious, and they usually manifest no disposition to reappear after extirpation. When deep-seated, they may exist for years, without the possibility of detection.

The removal of these excrescences is best effected by excision with the knife or scissors. The surface should always be touched immediately after with nitrate of silver or sulphate of copper. When situated low down in the urethra they may sometimes be caught in the loop of a silver wire, especially when they have a very narrow pedicle.

STRICTURE.

A stricture is a diminution of the caliber of the urethra, either of a transient or permanent character. The affection, in the former case, commonly depends upon a spasmodic contraction of the tube, and is hence known by the name of spasmodic stricture; it lasts only for a short time, is paroxysmal in its nature, and often disappears as suddenly and unexpectedly as it comes on. In the latter, on the contrary, it is always caused by an effusion of lymph into the lining membrane and the subjacent cellular tissue of the urethra, where a portion of this substance remains, and ultimately becomes organized. To this form of coarctation, to which the succeeding remarks will be limited, the term organic is usually applied, and, as signifying the same thing, the word permanent is occasionally employed.

Organic stricture presents itself in various forms. Thus, it may be simple or complicated, common or traumatic, partial or complete, soft or callous, dilatable or undilatable, permeable or impermeable, recent or old; terms which sufficiently explain themselves.

Much diversity prevails in relation to the seat, number, form, consistence, and extent of organic strictures.

No part of the urethra, except, perhaps, the prostatic, is entirely exempt from this disease. The results of my observations lead me to infer that the affection is most common, first, in that portion of the urethra which is comprised between the scrotum and the head of the penis; secondly, at the membranous part of the tube, or at the junction of this and the bulbous part; and, lastly, at the anterior extremity within a few lines of the meatus. Stricture at the prostatic portion of the canal is altogether an imaginary occurrence.

The seat of this disease has been very carefully examined by Mr. Henry Thompson, of London. The number of specimens inspected by him was 270, embracing 320 distinct strictures. Of these, 215, or 67 per cent. of the entire number, were situated at the junction of the membranous and spongy portions and its vicinity; 51, or 16 per cent., in the centre of the spongy portion; and 54, or 17 per cent., at the external orifice, and within two inches and a half behind this point. In 226 cases, the stricture was single, and in 185 of these it was situated at the posterior part of the membranous portion, and in 24, in the anterior.

In the majority of cases, there exists but one stricture; frequently, however, I have seen two, and occasionally, though very rarely, three, and even four. Hunter saw an instance of six, Lallemand of seven, Colot of eight.

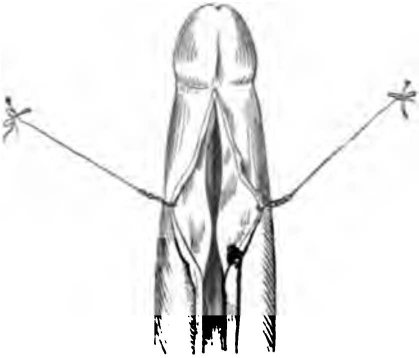
A very common *form* of stricture is that in which the urethra exhibits the appearance as if a thread or piece of twine had been tied round it. It may embrace the entire circumference of the tube, as in fig. 539, or only a part of it, and varies in its antero-posterior extent from half a line, or even less, to several inches. I have seen the contraction involve nearly the whole length of the canal.

A very rare form of the disease, called the *bridle stricture*, fig. 540, is occasionally met with. In this variety, the urethra is obstructed by a small, narrow band stretched across the tube from one side to the other. Sometimes it is arranged so as to divide the passage into two parts.

The contracted portion may be soft and elastic, or hard and firm, according to the duration of the disease, and the degree of transformation of the effused lymph, upon whose presence it essentially depends.

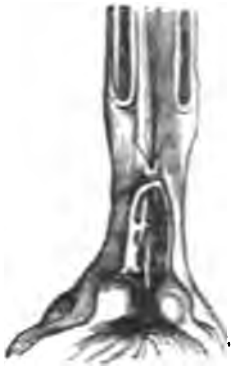
Are strictures of the urethra ever *impermeable?* Much has been said and written upon this subject, especially of late, and it is, therefore, very [illegible] that the meaning of the term should be clearly defined, and accurately [illegible].

Fig. 539.



Indurated stricture of the urethra.

Fig. 540.



Bridle stricture of the urethra.

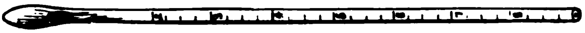
As long as a stricture admits of the discharge of urine, it cannot, in the [illegible] sense of the term, be considered as impermeable, although it may be impassable by the bougie, sound, or catheter. A stricture that is impermeable to urine is very uncommon; nevertheless, it occasionally occurs, both in the male and female. It has been asserted that there is no stricture that is impermeable to an instrument of some kind or other; that whenever there is room enough for the passage of urine, there is space enough for the introduction of a bougie or probe; that, when the surgeon fails to accomplish his object, his want of success is attributable rather to his own awkwardness than to the nature of the obstruction.

But the fact that this kind of stricture is ignored by certain pathologists, by no means proves that it does not exist. The urethra, for example, may assume a zigzag direction, or there may be a multiplicity of coarctations, so as, by changing the natural relations of the tube as to offer an insurmountable obstacle to the passage of the smallest instrument in the hands of the most adroit and accomplished operator; but I go farther, and assert, upon the testimony of personal experience, that there is a class of strictures, the result of ordinary causes, which, while they admit of the flow of urine, slowly and imperfectly it is true, do not permit the introduction of any instrument, however small, into the bladder.

The *symptoms* of stricture, considered generally, are, a diminution of the stream of urine, which is usually spiral, forked, or dribbling; frequent, slow, and difficult micturition, often preceded, accompanied, or followed by a sense of scalding; a discharge of thin, gleety matter from the urethra; uneasiness about the perineum, and anus; pain in coition; nocturnal emissions; elongation and thickening of the penis; and hardness at the seat of the obstruction, detectible by the finger. During the progress of the disease, the patient is liable to be troubled with swelling of the testicle, chordee, hemorrhoids, hernia, and retention or incontinence of urine. The general health is variously affected, and the slightest exposure, fatigue, intemperance, or irregularity in eating, is sure to be followed by an exacerbation of the local suffering.

Although the above symptoms are, in general, sufficiently denotive of the nature of the disease, they can, nevertheless, not be regarded as pathognomonic. To establish an unequivocal *diagnosis*, the urethra must be explored with an instrument. The one which I usually select for this purpose is a common silver catheter, of moderate size, and a little conical at the extremity, which is passed down the tube, first to the obstruction, then into it, and, lastly, if possible, beyond it. In this manner an idea is easily obtained of the seat and extent of the stricture, as well as of its consistence. When greater accuracy is required, I use a wax bougie, which is carried slowly down to the obstruction, upon reaching which the penis is pulled slightly forward, over it, and a mark made upon it with the thumb-nail immediately in front of the head of the organ. This will indicate the precise distance of the stricture from the external orifice of the urethra. I never employ the graduated bougie, like that represented in fig. 541, and so much

Fig. 541.



used by the French surgeons. The gutta-percha bougie is liable to break in the urethra, and should, therefore, be avoided. All examinations of this kind should be conducted with the utmost gentleness and deliberation. By slow and cautious manipulations, the point of an instrument may often be insinuated into the tightest stricture, or into one so tender and irritable as to resent every attempt at coercion.

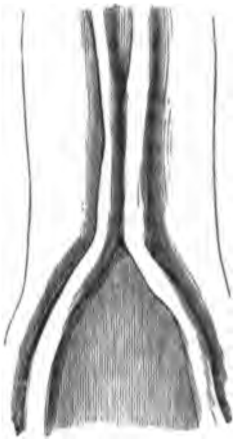
A tolerably correct idea of the nature, seat, and extent of a stricture, may sometimes be acquired by the application of the thumb and finger along the under surface of the penis. These remarks are, of course, chiefly applicable to strictures of the spongy portion of the urethra.

The *pathological effects* of stricture deserve particular study. The affection seldom exists long without giving rise to disease in the adjoining and associated parts. The organs which, besides the urethra, are most liable to suffer, are the prostate gland, the bladder, ureters, and kidneys. The testes, penis, seminal vesicles, perineum, and rectum, also not unfrequently participate in the evils consequent upon the malady.

An occasional, as well as a most serious, effect of stricture is a dilatation of the urethra behind the seat of the obstruction, as represented in fig. 542. This is evidently owing to the manner in which the urine is habitually impelled against the stricture. The canal in front of the obstruction is either normal, diminished, or dilated.

Another consequence of stricture is the development of fistule in the perineum, caused by ulceration or rupture of the mucous membrane behind the seat of the obstruction, and the escape of a small quantity of urine into the subjacent tissues.

Fig. 542.



Stricture of the urethra, with dilatation of the tube behind the obstruction.

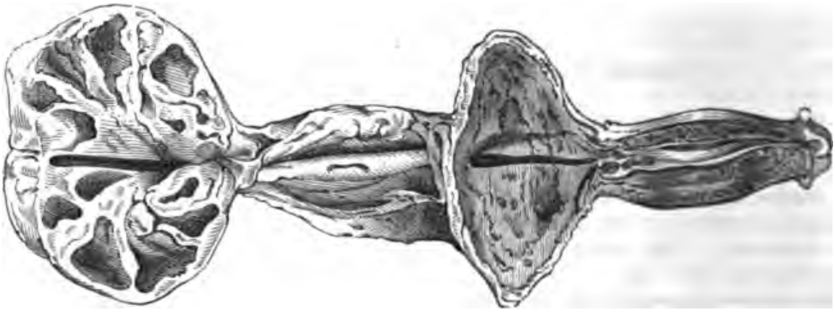
The most common lesion of the prostate, in tight, callous, and protracted stricture, is inflammation of the substance of the organ, eventuating occasionally in the development of an abscess, the formation of calculous concretions, or in great atrophy. Sometimes the gland is converted into a membranous pouch.

The bladder, in confirmed cases, soon becomes hypertrophied, and finally sacculated. There is also not unfrequently a remarkable proneness to the development of urinary calculi.

The most common lesions of the ureters are inflammation of their lining membrane, suppuration and deposits of lymph, and irregular dilatation of their caliber. Their parietes are often greatly thickened.

The kidneys are variously affected. Inflammation frequently occurs at an early period, and gradually progresses until it ends in serious mischief, if not in total ruin, of the affected structures. The adjoining sketch, fig. 543, strikingly illustrates the effects of stricture of the urethra upon the rest of the urinary organs. The prostate gland is completely destroyed, the mucous membrane of the bladder is removed by ulceration, the ureter is immensely enlarged, and the kidney is converted into a mere shell, filled at the time of the dissection with purulent matter. The drawing is from a specimen in the pathological collection of the New York Hospital.

Fig. 543.



Disease of the kidney, bladder, ureter, and prostate gland, from stricture of the urethra.

The *causes* of stricture may be conveniently arranged under two heads, the traumatic and the pathological. Of these, the latter are by far the more common. The particular kind of injury is generally a blow, fall, or kick upon the perineum, eventuating in a contusion or laceration of the lining membrane, or of this membrane and the subjacent tissues. A bad stricture sometimes results from violence inflicted by a catheter or a bougie. The cicatrice left after lithotomy has sometimes been succeeded by obstinate contraction.

Of the pathological causes of stricture by far the most frequent is gonorrhœa. It has been supposed that stimulating injections, employed too early in this disease, are capable of producing the affection; this is undoubtedly true, but I am satisfied that the occurrence is much less frequent than is generally imagined. Finally, stricture is occasionally produced by chancre of the urethra. The obstruction, when thus induced, is generally situated at the anterior extremity of the canal, at or just behind the external orifice.

The *prognosis* is variable. Stricture, if taken in hand before it has become hard or firm, or while it is still recent, and before it has given rise to any serious lesion of the urinary apparatus, is, in general, neither dangerous nor difficult of cure. When, however, it has made considerable progress, offers much resistance to the passage of the urine, and has excited inflammation in the neighboring organs, it may be considered as a very serious affection, liable, if permitted to proceed, to be followed by the worst consequences. As a general rule, it may be stated that a recent stricture is much more easy of cure than an old; a small, than a large; a soft, than a callous; a pathological, than a traumatic. Furthermore, a stricture of the membranous portion of the urethra is usually more difficult to manage than one of the spongy. An obstruction in this situation is also more liable, as a general principle, to awaken serious disease of the prostate gland, bladder, ureters, and kidneys.

When the stricture is obstinate and protracted, it may gradually so far undermine the general health as to cause death. Sometimes the brain sympathizes with the urinary troubles, and a slow, subacute inflammation, attended with coma, is set up in this organ and in the arachnoid membrane, eventuating at length in fatal serous effusion.

Finally, a hard, tight stricture may be a cause of impotence, by interfering with the ejaculation of the semen, the fluid, instead of passing off in the usual manner, being forced into the bladder, where, mingling with the urine, it is speedily devitalized.

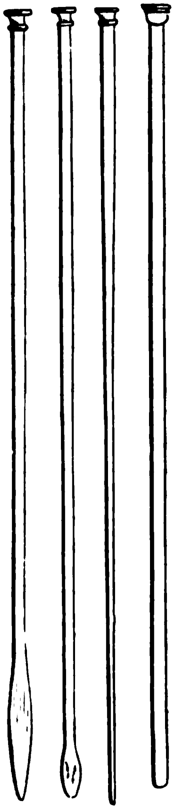
Treatment.—Different methods are employed for effecting the permanent cure of stricture. Of these the most important are dilatation, compression, cauterization, incision, and external division, each of which has been more or less modified, according to the prejudice, whim, or caprice of practitioners.

Before resorting to any of these expedients, it is of paramount importance to attend to the general health, and to subdue local inflammation. When the way has been thus paved, the particular kind of treatment is to be determined by a careful consideration of the nature of the obstruction.

1. *Dilatation.*—This process was applied to the cure of stricture at an early period of the profession, and was for a long time the only one in use. Various instruments have been recommended for effecting the dilatation. The most common are bougies, made of different materials, shapes, and sizes. The fact is, almost any substance, provided it is not too brittle, and admits of a good polish, may be used for the purpose.

Bougies are straight or curved, solid or hollow, cylindrical or conical, flexible or inflexible, according to the choice of the operator, or the exigencies of each particular case of stricture. The vesical extremity may be fusiform, olive-shaped, conical, or cylindrical, as in figs. 544, 545, 546, and 547. Much importance has been ascribed to this circumstance, and yet, strange to say, nothing definite has been agreed upon. If there is any preponderance of sentiment, it is, perhaps, in fávor of the conical shape, as this is generally most in accordance with the form of the stricture which the instrument has to penetrate. The length of a bougie varies from a few inches to that of the ordinary catheter. When the obstruction is situated at the anterior part of the tube, a short instrument is commonly more convenient and manageable than a long one.

Fig. 544. Fig. 545. Fig. 546. Fig. 547.



Different forms of bougies.

My conviction, founded upon ample experience, is, that the very best instrument for dilating a stricture is the common silver catheter, with a slightly conical point. I have now employed this instrument in the treatment of this affection for upwards of twenty-five years, and nothing could induce me to abandon it. It combines all the requisites that such an instrument ought to have, being light, firm, and durable. Independently of other considerations, a very strong reason for preferring a silver catheter to every other contrivance for dilating strictures, is the fact that it is often necessary to retain the instrument in the bladder, both for facilitating the cure, and drawing off the urine.

In performing the operation the same rules are to be observed, as it respects the position of the patient, the situation of the surgeon, and the warming and oiling of the instrument, as in ordinary catheterism. A small or middle-sized catheter, slightly conical at the extremity, being selected, it is passed down as gently as possible to the seat of the obstruction. Waiting a few moments, to enable the parts to accommodate themselves to its presence, it is gradually insinuated into the stricture, either by a steady backward pressure, or by a sort of rotatory movement, and is afterwards passed on into the canal beyond it. When this object has been accomplished, the instrument is either almost immediately withdrawn, or it is conveyed into the bladder, and retained there for the next twenty-four hours, or, perhaps, even a longer time. The latter course is the one which I usually adopt. By this method I have frequently succeeded in restoring the urethra to its natural size in a few days, even when the disease was of quite an obstinate character. When the dilatation is conducted upon this principle, it will sometimes be advantageous to use several catheters in succession, beginning with one that will readily enter and pass the stricture, and immediately after substituting one of a larger diameter.

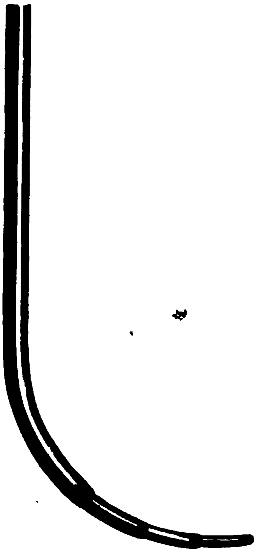
When the operation is thus forcibly performed, it is liable to be followed by inflammation of the urethra and sometimes even of the neck of the bladder and prostate gland. I have never, however, known it to assume a serious character from this cause. Still, such an event might happen, and it is therefore important that the practitioner should be aware of the fact. Considerable bleeding sometimes attends the operation, and now and then it is followed by severe pain, rigors, and high fever.

But dilatation is not always performed in this rapid and forcible manner. There is another mode of conducting it, more slow and gradual, if not more safe and free from suffering. The rule, in this case, is to proceed as cautiously and gently as possible, so as to avoid all risk of irritation, commencing with an instrument that will readily pass the obstruction, and using afterwards a series of steadily increasing sizes until the cure is perfected. The introduction is repeated, at first, every second or third day, and subsequently, when the canal has become more tolerant of the operation, once every twenty-four hours. When the dilatation has advanced considerably, it is a good plan occasionally to pass a small catheter, followed immediately by a larger one, which may be carried into the bladder and then almost instantly withdrawn. The obstacle is usually surmounted, by this method, in from one to two months, according to circumstances.

In whatever manner the dilatation is conducted, it is of paramount importance, after the cure is apparently completed, to introduce occasionally a catheter of large size as far as the bladder. If this precaution is neglected, the practitioner will soon have the mortification to find that the disease will return, perhaps even with increased force, thus imposing the necessity of subjecting the patient to another course of treatment.

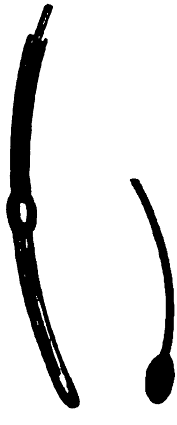
When the object is to dilate the parts very gradually, or when the process is obliged to be steadily maintained for a long period, benefit may be derived from the employment of the slippery-elm bougie. This is made of the inner bark of the tree of this name, of cylindrical form, with a slightly conical extremity, and of suitable size. Introduced into the tube, it soon expands under the moisture of the parts, and thus becomes a most efficient dilator.

Fig. 548.



Buchanan's compound circular catheter.

Fig. 549.



Sheppard's instrument for dilating the urethra.

In addition to the instruments here mentioned for dilating strictures, there are others which, from the reputation of their inventors, as well as from their own intrinsic value, are deserving of consideration. The annexed sketch, fig. 548, represents the compound circular catheter, as it is termed, of Dr. Andrew Buchanan, of Glasgow, consisting of a series of graduated silver tubes sliding one over the other, a round-pointed probe being passed through the innermost one, to serve as a guide through the stricture.

Mr. Sheppard, of England, uses a very small catheter, with a groove on one side, in which there is a fine sliding wire, furnished with a metallic button, of which there are various sizes. The instrument is seen in fig. 549.

The dilators of Mr. T. Wakley, of London, better known in England than in this country, are shown in the adjoining cuts. They consist, first, of two directing-rods, one straight and of solid steel, fig. 550, the other curved and hollow like a catheter, as seen in fig. 551. Both are very slender, hardly exceeding the size of a knitting-needle, in order that they may be the more readily passed through the stricture into the bladder. Secondly, there is a series of silver and of gum-elastic tubes which, slipped over the directing rods, act as dilators, stretching and expanding the urethra firmly and equably at every point of the seat of the obstruction. The silver tubes, of which fig. 552 is a representative, are straight, conical at the distal extremity, and furnished with a horizontal handle. The gum-elastic, of which one is shown in fig. 553, are adapted to the silver catheter, and are designed for the dilatation of strictures situated in the membranous portion of the urethra, their extremity being tipped with metal to promote their introduction. Both classes of instruments are graduated, the smallest being just one size larger than the directing-rod, and the largest equal to a No. 10 bougie.

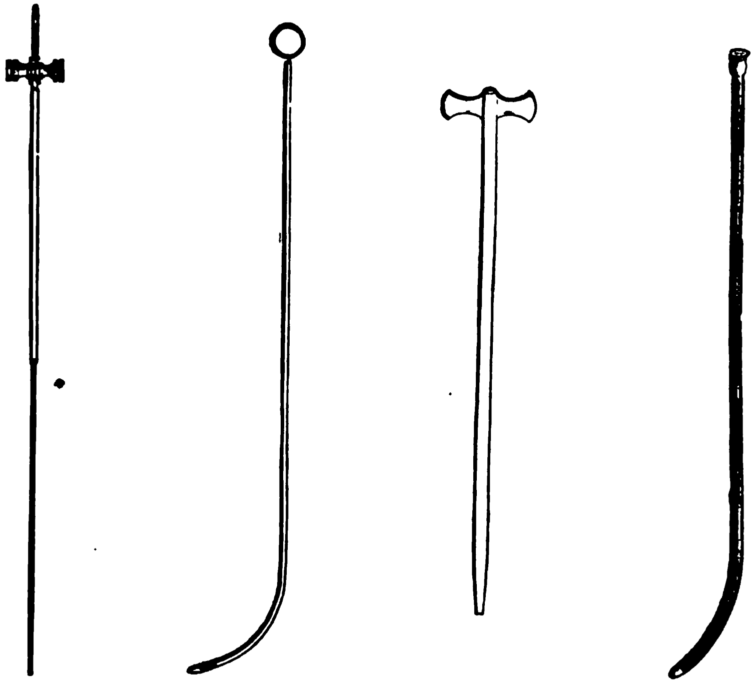


Fig. 550. Fig. 551. Fig. 552. Fig. 553.

Wakley's stricture instruments.

All these instruments, besides several others of a similar character, described and pictured in different surgical treatises, are designed for rapid and forcible dilatation; and they possess the additional advantage, especially in the hands of inexperienced practitioners, over the more common contrivances, in being furnished with small directors by which they may be safely guided through the strictured parts of the urethra, particularly if, as they are passing through the membranous and prostatic portions of the tube, the operator retains his finger in the rectum.

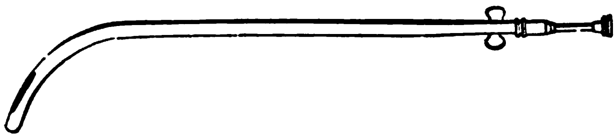
2. *Compression.*—The process of dilatation is mainly applicable to soft and recent strictures. When the obstruction is so hard and tight that it cannot be penetrated in the usual manner, an attempt may be made to remove it by pressing the end of the instrument against its anterior extremity. The operation is conducted upon the same principles as in gradual dilatation. Ulceration and suppuration occasionally follow this method, effects which should be carefully avoided.

I have not much experience with this mode of treatment, and I candidly confess that I have a feeling against it, almost amounting to aversion. The only case to which it seems to me to be at all applicable is, where the stricture is situated in the membranous portion of the urethra, and is so tough and narrow as to resist the ordinary method. A cure, if obtainable at all in this way, must necessarily be very tedious.

3. *Cauterization.*—Cauterization, properly conducted, is a valuable curative agent; but, if indiscriminately employed, it is capable of doing serious, if not irreparable, mischief. The circumstances to which it appears to be more particularly adapted, and to which, in my judgment, it ought to be restricted, are those in which the stricture, without being very tight or extensive, is of a firm, gristly, and resilient character, and in which there is an undue amount of morbid sensibility of the mucous membrane of the urethra. It may be further observed that cauterization alone should seldom be relied upon, but that its action should always be aided by the bougie or catheter.

Cauterization, as practised at the present day, is generally effected with the nitrate of silver, applied by means of a porte-caustique, represented in fig. 554.

Fig. 554.



Author's porte-caustique.

It is fashioned like a common silver catheter, and is either straight or curved, according to the situation of the stricture. At the posterior surface of its vesical extremity is an eyelet, about three quarters of an inch in length by a line and a half in width, which corresponds with the caustic in the cup, attached to a rod in the interior of the tube. The cup is partially filled with simple cerate, or extract of hyoscyamus, which is next sprinkled with a thin layer of the powdered salt, when it is fit for use. Such an instrument is far preferable to the ordinary porte-caustique, which, from the peculiarity of its construction, is liable to break off in the urethra, an accident which can never happen to this.

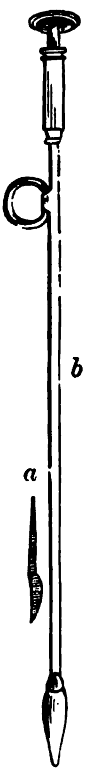
The patient, during the operation, observes the same posture as in ordinary catheterism. The instrument being conveyed down to the stricture, or rather into it, the stylet, previously retracted, is pushed on until the cup is opposite the eyelet above described. Then, by a sort of rotatory movement of the tube, the caustic is brought fairly in contact with the whole of the affected surface. The application, which is continued only for a few seconds, is renewed every fifth or sixth day. It is usually attended with some pain, and is followed by a frequent desire to urinate, by a sense of scalding in the urethra, and by a thin, sero-sanguinolent discharge, which, in a short time, assumes a muco-purulent character, and generally disappears altogether, along with the other symptoms, in four or five days.

Some practitioners are very fond of using, in bad cases of stricture, *caustic potassa*, as originally recommended by Mr. Whately, the most able and strenuous advocate of the treatment, at the present day, being Mr. Robert Wade, of London. I have myself occasionally employed this article, and, although it is not so generally applicable as the nitrate of silver, the beneficial effects of it are sometimes very striking, especially when the obstruction is very hard, dense, and gristly. The operation is best performed with the ordinary porte-caustique, about the tenth of a grain of potassa, mixed with a little lard, being introduced into the cup of the stylet, which is then moved back and forth over the contracted surface until a feeling of heat is experienced, when it is instantly withdrawn. If the stricture is very old and firm, a little more liberty may be taken, but even then much caution should be exercised. When the porte-caustique cannot be inserted, the caustic may be passed upon the end of a wax bougie, scooped out for the purpose. The application may be repeated every eighth, tenth, or twelfth day. The after-treatment is the same as in ordinary cauterization.

4. *Incision.*—When the stricture is very old, gristly, tight, and intractable, or indisposed to yield to dilatation, or dilatation and cauterization, incision may be used.

The instruments required for this operation vary according to the seat and nature of the stricture. When the coarctation is seated at the orifice of the urethra, or just behind it, a bistoury will answer every purpose; but for the remainder of the tube, the best urethrotome is one composed of a grooved canula, containing a stylet, armed with a little blade, which is made to project at will. The extremity of the canula, which is intended to lie within the stricture during its division, is of a conical shape, quite narrow, and about three-quarters of an inch long. The instrument which I have been in the habit, for many years, of employing in permeable strictures, is exhibited in fig. 555; *a* representing the blade, and *b* the canula, with the stylet and blade retracted.

Fig. 555.



Urethrotome.

When the disease is situated just behind the opening of the urethra, I always employ a very narrow, blunt-pointed bistoury, with which the contracted part is freely divided in its entire length, either laterally, above and below, or at all these situations, according to the nature and extent of the obstruction. For cutting a stricture situated between the head of the penis and the bulbous portion of the tube, a straight, lateral-bladed stylet is the most convenient. The conical extremity of the instrument being securely engaged in the contracted part, the penis is drawn forward, and the lancet pressed steadily against the resisting surface until it is completely divided at two, three, or more points of its circumference. For a stricture of the membranous portion of the urethra, the most suitable instrument is a curved perforator, used upon the same principle as the lateral-bladed stylet, but with a greater degree of caution, as this part of the canal is more intricate in its relations and direction. In whatever manner the operation is performed, the moment it is over a metallic catheter is passed into the bladder, and permanently retained until the urethra has regained its natural character.

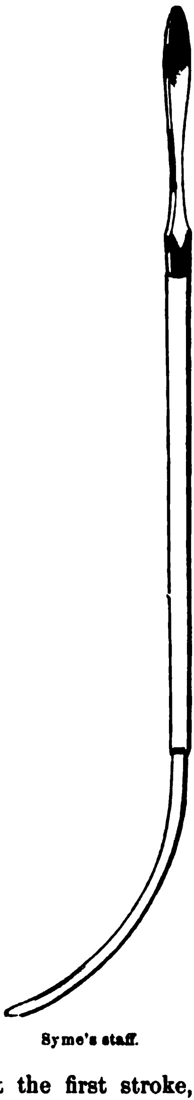
When the stricture is very large, or hard and tortuous, more than one operation may be necessary to effect its division; but, in general, I prefer to do all that is necessary at one time.

5. *Perineal Section.*—This is nothing less than the division of the stricture by an external incision, extending down through the urethra, and embracing the whole of the coarctated surface. The method was devised by Mr. Syme, of Edinburgh.

In performing the operation, which was originally described under the appellation of "external division," but which is now more generally known under that of the "perineal section," the patient is placed in the same position as in the operation for stone. A sound, slightly curved, and sufficiently small to pass readily through the stricture, is then introduced into the bladder, and intrusted to an assistant. The parts being shaved, the nates are brought to the edge of the table, and the surgeon, sitting on a low chair, or resting upon one knee, makes his incisions exactly in the middle line of the perineum, the raphé serving as a guide to the instrument. Having divided the superficial structures, he feels for the staff, and, plunging his knife into its groove, he cuts the indurated and contracted tissues through their entire extent, thus laying the surface completely open, precisely as in the operation for anal fistule. The whole wound does not exceed an inch and a half, and occasionally it need not even be so large. Care should be taken not to divide the deep fascia of the perineum, lest extravasation of urine should take place. As soon as the stricture has been thoroughly opened, a medium-sized catheter is carried into the bladder, where it is retained by suitable apparatus for at least forty-eight hours, when it is removed, cleaned, and immediately reinserted.

Mr. Syme has constructed a staff for the purpose of simplifying the whole procedure, and thus enabling the surgeon to make his incisions with greater ease and precision. The instrument, represented in fig. 556, on a scale exactly half the length, but of its proper diameter, is very slender at the vesical extremity, and is thus readily passed through the stricture into the bladder, while the other portion, which is as large as a No. 8 catheter, stops abruptly in front of the obstruction, thereby indicating its anterior limit, and the point, consequently, at which the incision should terminate in this situation.

Fig. 556.



Syme's staff.

The perineal section has met with much opposition, founded, in great measure, upon ignorance and prejudice, though there is no doubt that it has been much abused. When the cases are well selected, and the operation is properly executed, the effects are generally all that could be desired. Cases undoubtedly occur where it proves fatal, or where, especially if the after-treatment is neglected, it is followed by relapse, but such results are, in some degree, inevitable in all important operations performed for the relief of chronic disease of the urinary apparatus. The most common causes of death are shock, erysipelas, pyemia, and urinary infiltration. Out of 108 cases operated upon by Mr. Syme, up to 1863, two only ended fatally.

6. *Button-hole Operation.*—This operation, as the term "la boutonnière"—originally applied to it—literally signifies, is generally limited, at the present day, to impassable strictures, situated in the membranous portion of the urethra, or in that division of the tube which corresponds to the perineum, although Desault considered it as applicable to strictures admitting of the introduction of the staff. It would be well, I think, if the process could be made to include the external division of hard and impermeable coarctations, no matter in what part of the urethra they may be located. The effect of such an arrangement would be to avoid confusion between this method and the perineal section, just described.

In performing the operation, the patient is placed in the same position as in lithotomy. A staff, or grooved director, either straight or slightly curved, is conveyed to the seat of obstruction, and confided to an assistant, who also holds up the scrotum. An incision is made into the raphé of the perineum, about an inch and a quarter in length, taking care, on the one hand, not to interfere with the rectum, and, on the other, not to extend it too high up towards the bulb of the urethra. The knife is plunged in, at the first stroke, to a considerable depth, and then divides, by successive touches, the parts covering the stricture. The surgeon, feeling now for the end of the staff, inserts the point of the instrument into the contracted part, which is next freely cut in a direction from before backwards. A catheter being introduced into the bladder, the case is managed, in all respects, as if it were one of lithotomy. There is usually but little bleeding, and the wound seldom remains open beyond the fifteenth or eighteenth day. The treatment after the operation is conducted precisely in the same manner as in the case of the perineal action. The use of the catheter should be persisted in for a long time after the parts are cicatrized, otherwise relapse will be inevitable, such is the tendency to contraction. When the operation has been well executed, the cure is generally permanent.

The procedure, which requires the most consummate skill for its successful execution, is by no means free from danger. Several cases have been reported, in which death occurred from hemorrhage, shock, inflammation, or purulent infiltration.

Injurious Effects of Operations on the Urethra.—The different methods of treatment now described are all liable, however carefully or judiciously conducted, to be followed by very serious and even fatal consequences. It is well known that patients, especially such as are very nervous and irritable, occasionally suffer most violently from the most trifling operations upon the urinary organs.

In another class of cases, a still more serious effect is occasionally witnessed, especially of operations upon the urethra and the neck of the bladder. I allude to the occurrence of *pyemia*, or the formation of matter in the joints, muscles, veins, cellular tissue, and other structures. The disease sometimes resembles an attack of ordinary intermittent fever. Occasionally, again, it closely simulates gout or rheumatism. In whatever manner it makes its appearance, the case soon assumes a most threatening character.

In regard to the unpleasant nervous symptoms which occasionally succeed these operations, much may be done in the way of prevention by the use of chloroform; but when they are unavoidable, no time should be lost in moderating and relieving them. From half a grain to a grain of morphia, according to the age and condition of the patient, is given at a single dose, along with a liberal quantity of brandy, or brandy and spirits of camphor. The extremities, and even the spine, are covered with sinapisms, and cloths, wrung out of hot water and laudanum, are steadily maintained upon the genitals, perineum and hypogastrium. If undue reaction takes place, abatement may be sought with the lancet and tartar emetic, or calomel and ipecacuanha; but these remedies must be employed with great caution, otherwise they may induce injurious debility.

Arthritic symptoms, and the formation of matter in the cellular tissue, joints, muscles, and viscera, must be met by leeches, blisters, iodine, and warm fomentations, medicated with laudanum and acetate of lead, and by the internal use of calomel and opium, aided, if necessary, by suitable stimulants, as carbonate of ammonia, quinine, wine, brandy, and porter. Superficial abscesses must be opened by early and free incisions, both to relieve pain and prevent further contamination of the system. Unfortunately, however, no mode of treatment, whatever may be its character, can avail much under such circumstances, death being the lot of almost every patient thus affected.

INFILTRATION OF URINE.

By the term "infiltration" as applied to the urine, is understood an escape of this fluid from the urinary passages, and its diffusion through the surrounding tissues. There are two forms of this affection, the vesical and the urethral.

The accident, in whatever manner it may present itself, is always most unfortunate. The urine, putrid and poisonous from long confinement, lights up severe inflammatory action, rapidly terminating in gangrene of the affected structures. The patient sinks into a low typhoid condition, attended with hiccup and muttering delirium speedily followed by exhaustion and death.

The *vesical* form of the lesion may be produced by a rupture of the bladder from external violence, from over-distension from urine, or from perforative ulceration of the coats of the organ. After lithotomy, infiltration is unfortunately but too common, especially in the hands of ignorant operators, and is one of the chief sources of danger.

The prognosis is generally very unfavorable, the treatment being in the highest degree unsatisfactory. When the urine has a tendency to advance towards the perineum, the great remedy obviously consists in making early, free, and dependent incisions, to give vent to pent-up fluids, and in sustaining the system by the timely use of tonics and stimulants.

The *urethral* form of infiltration is more common than the vesical, but, in general, more manageable. If the rupture takes place in the commencement of the membranous portion of the urethra, behind the triangular ligament, the case may remain obscure for several hours, or even days. The most reliable symptoms of the accident are, pain and deep-seated throbbing; difficulty, if not utter impossibility of voiding the urine, with, perhaps, a frequent desire to do so; a sense of fulness in the anus and rectum; tenderness in the hypogastrium; and excessive constitutional disturbance. By and by, the urine makes an effort to approach the surface, its progress being preceded and accompanied by heat, pain, redness and swelling, and by a rapidly increasing typhoid state of the system.

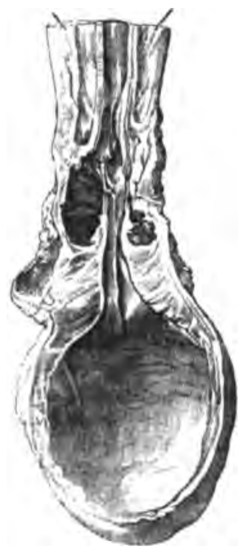
If the rupture occurs in that portion of the urethra which lies in front of the triangular ligament, between it and the bulb, the urine escapes into the cellular tissue of the perineum, and proceeds forwards and upwards underneath the dartos into the scrotum, its passage being marked by a red, erysipelatous blush of the surface, and by enormous tumefaction, which are soon succeeded by black, gangrenous spots, and an emphysematous condition of the areolar tissue.

The prognosis is seldom flattering, though apparently the most desperate cases occasionally recover. The first, and, in fact, almost the only thing to be done, in the early stage of the affection, is to make large and dependent incisions, to afford vent to the pent-up and irritating fluids. A catheter should then be introduced into the bladder, and allowed to remain there during the cure. The best local applications, after the parts have been properly divided, are warm fomentations with acetate of lead and opium, hops, or poppy heads. When the sloughing process has fairly begun, the fomentations may be advantageously superseded by emollient poultices, with the addition of yeast, port wine, nitric acid, or chlorinated soda.

URETHRAL ABSCESS.

Abscesses, to which the term urinary is usually applied, are liable to form in the cellular tissue round the urethra, fig. 557, leading, if improperly managed, to fistules and other mischief. Their ordinary site is the perineum, between the bulb of the urethra and the anus. A very common situation also is the upper part of the perineum, just behind the junction of the cavernous bodies of the penis, and, consequently, at the inferior portion of the scrotum. The next most frequent point is the scrotum itself, and, lastly, the under surface of the penis. Urethral abscesses are generally small and circumscribed.

Fig. 557.



Urethral abscess, the tube being laid open; a stricture at the commencement of the bulbous portion; and false passages, one of which leads into an abscess that surrounds the membranous portion.

The exciting *causes* are various. The most common, perhaps, is the existence of a tight, organic stricture of the urethra, attended with attenuation and dilatation of the tube immediately posterior to it. During a violent effort at micturition, the tube gives way behind the seat of the obstruction, sending the urine abroad into the connective tissues. A few drops thus effused are often sufficient to cause an immense abscess, accompanied by great suffering, both local and constitutional.

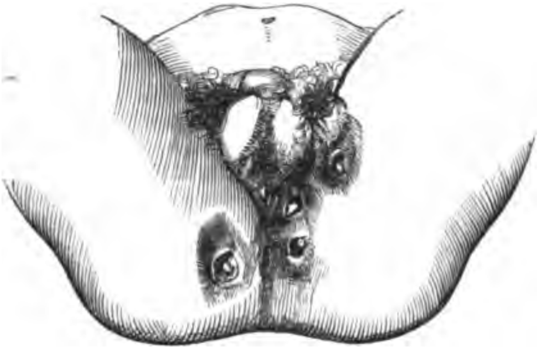
The existence of the disease is in general easily determined. The perineum is of a reddish, erysipelatous appearance, swollen, painful, and tender on pressure; progression is difficult, trouble is experienced in micturition, especially if the case is already somewhat advanced, and there is usually more or less fever, attended, when there has been an effusion of urine, with a tendency to delirium. Fluctuation is best detected by inserting one finger into the rectum, and placing the other over the tumor in the perineum.

The *treatment* is sufficiently simple. The antiphlogistic regimen, rest, recumbency, leeching, and fomentations, will limit the morbid action; while a free and timely external incision will prevent the diffusion of matter and urine. When the sac has been emptied, and the accompanying inflammation has, in a great measure, disappeared, a catheter should be retained in the bladder, to prevent the escape of its contents by the abnormal orifices, the edges of which are to be touched, from time to time, with nitrate of silver, to promote cicatrization.

URETHRAL FISTULE.

The most common site of urethral fistule, represented in fig. 558, is that portion of the tube which corresponds with the perineum and the scrotum; the disease sometimes exists farther back, and, on the other hand, cases occur in which it is found near the anterior orifice.

Fig. 558.



Urinary fistules.

The abnormal channel, whether single or multiple, long or short, straight or devious, is originally merely a sinus, or tubular ulcer, which is soon covered by granulations, and ultimately lined by an adventitious membrane.

The immediate *cause* of this affection is a destruction of the mucous membrane, produced by ulceration, abscess, gangrene, or laceration, and followed by an escape of urine into the connecting cellular tissue. Here, acting as a powerful irritant, the fluid speedily excites inflammation, which soon terminates in suppuration, if not in the death of the affected parts. When the matter is evacuated, or the slough detached, the urine issues at the accidental opening, which now constitutes, in the true sense of the term, a fistule.

The efficient causes are various. The most frequent, undoubtedly, is stricture, attended with dilatation of the tube behind the seat of obstruction; but it may also result from ill-managed attempts to pass instruments, the protracted sojourn of catheters and bougies, gonorrhœa, retention of urine, external violence, and the operation of lithotomy.

The *diagnosis* is usually easy. An opening exists in some portion or other of the urethra, transmitting a urinous fluid, either in drops, in jets, or in a continuous stream synchronous with the act of micturition. A probe of small size, introduced into the external orifice, readily enters the urethra, provided the abnormal passage is not very narrow, oblique, angular, or sinuous.

The *treatment* of this affection, although obvious enough, is not always easy. The first thing to be done is to seek for, and, if possible, to remove, the exciting cause. In most cases this will be found to be a stricture, probably of long standing. Having already, in a previous page, spoken at length of the character and treatment of this affection, it is not necessary to refer to the subject here, any farther than to observe that, when the disease upon which the fistule depends is removed, the abnormal track ordinarily closes of its own accord. In general, it will be best to use a silver catheter, rather over than under the usual size, to be permanently retained, unless it should prove a source of decided suffering. Conducted upon this principle, the treatment rarely fails in the more mild and uncomplicated forms of the malady. It sometimes, however, happens, after all obstruction in the urethra has been removed, that the fistule manifests no disposition to heal, but remains pervious to the urine. The occurrence may be owing to various circumstances. Very often it depends upon a callous condition of the parts, preventing the edges of the sinus from coming in contact. When this is the case, the object should be to destroy the secreting surface, and to promote the granulating process by stimulants and escharotics, especially the nitrate of silver. In rebellious cases recourse may be had to the heated wire, or to a probe dipped in nitric acid or the acid nitrate of mercury.

When the fistule is obstinate and protracted; when its internal orifice is uncommonly large, or when there are several openings of this kind; or, finally, when it depends upon an old stricture, so firm, narrow, and extensive that it cannot be destroyed in the ordinary manner, the only course left is to lay the parts open by an external incision, and to heal them over a silver catheter.

When the fistule involves the spongy portion of the urethra, and has been caused by chancre, or external injury, attended with loss of substance, it may be necessary to have recourse to suture. The one usually employed is the twisted, made with short, slender needles, placed not more than a line and a half apart. The principal objection against the use of the suture, in any form, for the relief of this affection, is its liability to tear itself out before the completion of the adhesive process, in consequence of morbid erections of the penis. To guard against these erections, recourse should be had to anodyne enemata, or suppositories of opium and camphor, and to the application of pounded ice to the perineum. Excision has sometimes been practised with advantage.

When there is considerable loss of substance, *urethroplasty* may become necessary, the requisite amount of material being borrowed from the neighborhood and carefully adapted to the edges of the opening, previously refreshed with the knife. The operation, however, generally signally fails, whatever care may be taken in its execution, owing to the difficulty of preventing the contact of the urine. In order to guard against this, it has been proposed, after the edges of the fistule have been properly pared, to dissect up a large cutaneous flap on each side, and to unite them by suture along the middle line, over a piece of India-rubber, as exhibited in fig. 559. Or, instead of this, the integument may be dissected up subcutaneously, as in fig. 560. Whatever procedure be adopted, a medium-sized catheter should be retained in the bladder until the adhesion is completed, the urine being voided at stated periods, while gentle pressure is

Fig. 559.

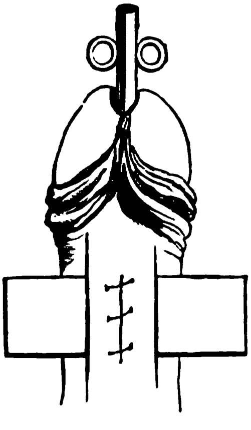
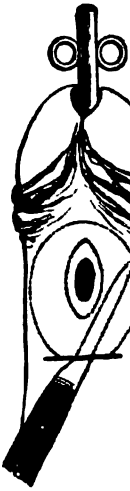


Fig. 560.



Urethroplasty.

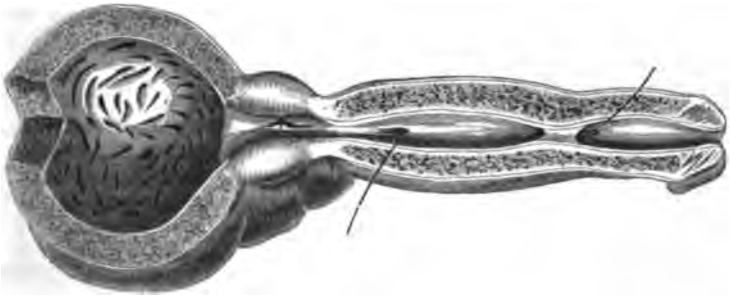
made below the seat of the fistule, in order to prevent the fluid from passing by the side of the instrument.

The difficulty of effecting adhesion of the transplanted integument in this operation is generally so great that it seems to me it would be well, until this is accomplished, to afford the urine an opportunity of passing off by the perineum, a small opening sufficing for this purpose.

FALSE PASSAGES.

A false passage is an artificial canal communicating with the urethra, and generally produced by the injudicious use of instruments. All portions of the canal are subject to it, but it is most frequent in the membranous and prostatic. The lesion is well seen in fig. 561, from a preparation in my cabinet.

Fig. 561.



Stricture of the urethra, with false passage; enlargement of the prostate gland, and hypertrophy of the bladder.

The artificial route is commonly situated at the inferior surface of the tube, chiefly because when an instrument is attempted to be introduced into the bladder, its point is almost always pressed in this direction, which also presents the greatest number of natural obstacles to its easy passage. The new channel, which is usually single, varies in length from a few lines to several inches, and may occur either as a cul-de-sac or as a distinct canal, the distal extremity opening into the urethra, or, perhaps, as occasionally happens, into the bladder, or even into the rectum.

The *effects* of a false passage vary according to circumstances. When it consists of a mere cul-de-sac, little or no harm generally results; but when the route exists in the vicinity of the bladder, especially if it communicates with this reservoir, the danger may be very great, for it may then give rise to infiltration, abscess, and gangrene. When it extends into the rectum, or the rectum and bladder, a permanent fistule may follow.

The formation of false passages is seldom indicated by any reliable *symptoms*. The most common are hemorrhage, pain, and a feeling of laceration; but these, upon being carefully scrutinized, will be found to be of no value whatever as diagnostics. How, then, is the existence of the lesion to be determined? Is any confidence to be placed in the observation of the surgeon? The only circumstances worthy of notice, as far as he is concerned, are, first, a peculiar grating sensation communicated to his hand while engaged in operating upon the urethra; secondly, a sudden slipping of the instrument from its position, or a feeling as if something had given way; and, thirdly, a deviation of the instrument from the normal direction of the canal.

The *treatment* of false passages must be conducted on general principles. Hemorrhage must be arrested, pain allayed, and further irritation by the use of instruments prevented. Rest in the recumbent posture, light diet, purgatives, antimonials, leeches, fomentations, and the warm hip-bath will, in general, put a speedy stop to the local inflammation. Urinary infiltration is a rare occurrence, owing to the fact that the water, flowing in a direction opposite to the artificial opening, is unable to insinuate itself into it.

HETEROLOGOUS FORMATIONS.

The urethra, like the urinary bladder, is liable to the heterologous forms as scirrhus, encephaloid, and tubercle. These affections, however, are rare, especially as independent deposits, and their occurrence is rather in a pathological than in a practical point of view. Of colloid and of this tube, we are entirely ignorant.

There are no symptoms by which, in either sex, carcinoma of the urethra earlier stages, can be distinguished from other affections. All treatment with a view to palliation, is futile. Should retention of urine occur, the growth must be perforated with the catheter, or, when this is impracticable urethra must be laid open behind the tumor.

SECT. IV.—DISEASES AND INJURIES OF THE PROSTATE GLAND.

The prostate gland, from the peculiarity of its situation, and its intimate nection with the bladder, the urethra, and the seminal vesicles, is exposed to inconvenience and hardship, rendering it liable to various but, until the age of puberty, it has merely a rudimentary existence, and is fore, seldom affected in any way. After its functional activity, however, awakened, it becomes more liable to disorder, and this tendency may be steadily to increase as we advance in life.

The affections of the prostate may be conveniently arranged under the ing heads:—1. Inflammation. 2. Suppuration and abscess. 3. Ulceration. Hypertrophy. 5. Atrophy. 6. Prostatorrhœa. 7. Heterologous forms. 8. Cystic disease. 9. Fibrous tumors. 10. Hemorrhage. 11. Calculi. Sacciform disease and fistule.

1. ACUTE PROSTATITIS.

Acute inflammation of the prostate seldom exists as a primary affection when it is produced by direct injury. Idiopathically considered, it is frequently met with in middle life, when the genital organs are in their and in active sympathy with the rest of the system.

The characteristic *symptoms* are deep-seated, burning, and throbbing gradually increasing difficulty in micturition, excessive scalding of the urethra the urine flows over its mucous surface, a feeling of weight and stuffing rectum, constant tenesmus and desire to relieve the bladder and bowels, flattened form of the feces. If the finger be inserted into the rectum, may be distinctly felt as a solid, painful tumor, sometimes almost sufficient to close the tube and seriously impede defecation. If the surgeon attempt introduce a catheter into the bladder, he will find it exceedingly difficult impracticable, unless he possesses more than ordinary skill in the management of the instrument. The local symptoms are generally accompanied by marked constitutional disturbance.

The most common exciting *causes* of acute prostatitis are gonorrhœa, of the urethra, venereal excesses, horseback exercise, external injury, and pression of the cutaneous perspiration.

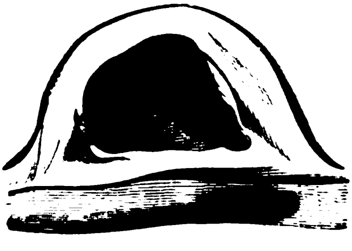
Although this disease is seldom dangerous to life, or disposed to run into puration, yet, in view of the great suffering which it induces, the *treatment* always be of the most prompt and decisive character. Active depletion by lancet, and by leeches to the perineum and anus, is always indicated, especially if the patient is robust, and should be practised without delay. If the bowels are costive, the venesection is immediately followed by a brisk cathartic, sisting of castor oil, or calomel and jalap, assisted, if necessary, by enema. Fever is combated by the antimonial and saline mixture, in union with and aconite, in the hope of allaying pain and depressing the heart's action. Relaxation of the skin is promoted by hot steam, conveyed to the body by means of a tube connected with the spout of a tea-kettle. The genital organs, hypogastrium, and perineum, should be enveloped in flannel cloths, wrung out of warm water and laudanum; and the pain and straining, which so commonly attend the disease, are generally promptly relieved by a full anodyne injection.

The condition of the bladder is early attended to, retention of urine being promptly relieved by the catheter, handled with the greatest gentleness. Absolute recumbency is indispensable throughout the whole treatment; the diet must be of the blandest character, and drink of every description is abstained from, in order to secure repose to the inflamed parts.

2. ABSCESS.

Acute inflammation of the prostate occasionally terminates in abscess. When this event is about to take place, there is an increase of all the previous symptoms, both local and constitutional. The pain is exceedingly violent, and is soon followed by complete retention of urine. Severe rigors, alternating with flushes of heat, are present, and the patient soon becomes delirious. An examination by the rectum often detects fluctuation. When the abscess tends towards the perineum, its advent is always preceded by marked swelling, an erysipelatous blush of the surface, and an œdematous condition of the subcutaneous cellular tissue.

Fig. 562.



Abscess of the prostate.

The annexed cut, fig. 562, affords a good illustration of an abscess of the prostate, as it occurred in an elderly man, who died from the effects of the disease, ten days after the commencement of the first symptoms. The pus was of a thick, cream-like consistence, and of a yellowish color, its quantity being a little over a teaspoonful. The inflammation had deeply involved the neck of the bladder.

Abscess of the prostate is generally a dangerous affection. When recovery occurs, the patient may be troubled with a fistulous communication with the rectum, urethra, perineum, or bladder.

In the *treatment*, two important indications are presented; first, to limit the suppuration, and, secondly, to afford a speedy outlet to the effused fluid. To fulfil the first, prompt recourse must be had to depletion, provided this has not already been carried sufficiently far, to antimonials, diaphoretics, anodynes, and emollient applications. Blood may be taken by leeches from the perineum and hypogastrium.

In order to fulfil the second indication, the rule is to anticipate nature by an artificial opening. If the abscess points towards the perineum, an incision should be made in the most prominent part of the swelling, with a long, straight, narrow-pointed bistoury, care being taken to avoid, on the one hand, the rectum, and, on the other, the bladder.

When the abscess points towards the rectum, it may readily be reached with a long, curved trocar. For some days after the operation the lower bowel should be kept as quiet as possible.

When the abscess bulges inwards towards the urethra and the neck of the bladder it may be punctured with a common silver catheter; or, instead of this, a sound with a conical beak and a small curve may be used. When the abscess is not yet completely matured, and delay would be improper, the operation may be executed with a lanceted stylet. The urine should be frequently drawn off with the catheter.

3. ULCERATION.

This affection is of infrequent occurrence and of difficult recognition. It is induced by various causes, of which the principal are wounds, contusions, lacerations, and the presence of calculous concretions in the substance of the organ.

The *symptoms* are such as indicate the existence of chronic disease of the prostate and of the neck of the bladder. Perhaps the most reliable circumstances, in a diagnostic point of view, are, the absence of vesical calculi, long continued suffering, as a sense of weight, aching, and throbbing at the neck of the bladder, a constant secretion of thick, glairy mucus, a frequent desire to micturate, and an occasional discharge of blood, with excessive burning during the accumulation of the urine.

The *treatment* of this grave affection is altogether unsatisfactory and empirical. Attention must be paid to the general health; the patient should avoid exercise and the erect posture; the bladder should be daily washed out with tepid water, either simple or medicated; and the affected surfaces should be lightly touched twice a week with a solution of nitrate of silver, as ten grains to the ounce of water, applied with a piece of soft sponge, projected from a silver canula. The best internal remedies are, balsam of copaiba, cubebs, and spirits of turpentine, largely diluted with demulcent fluids. Anodynes must be freely used both by the mouth and by the rectum.

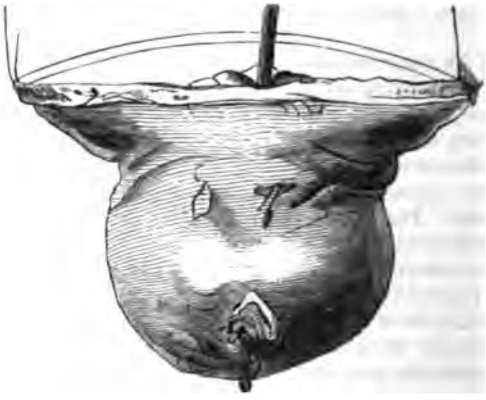
4. HYPERTROPHY.

Hypertrophy of the prostate is an augmentation of volume of this organ, produced by increased nutrition. There are several forms of the complaint, of which the most common is that to which the term senile has been applied, from its being a frequent accompaniment of old age.

Hypertrophy may occur in any part of the organ. Most commonly it affects the entire gland, though not uniformly. Occasionally it is almost exclusively confined to the third lobe, even, perhaps, when the enlargement is so great as to cause retention of urine, and, ultimately, the patient's death.

The hypertrophy exists in various degrees, from the slightest increase of the natural volume of the prostate to the dimensions of a pullet's egg, a walnut, or a medium-sized orange. In rare cases, it may exceed the latter dimensions. The greatest increase of volume usually occurs in the long axis of the organ, in consequence, no doubt, of a want of resistance in this direction. The annexed drawing, fig. 563, from a specimen in the collection of Dr. Mott, affords a good illustration of what may be called uniform hypertrophy of both lobes of the prostate. Fig. 564, from one of my preparations, exhibits great enlargement of

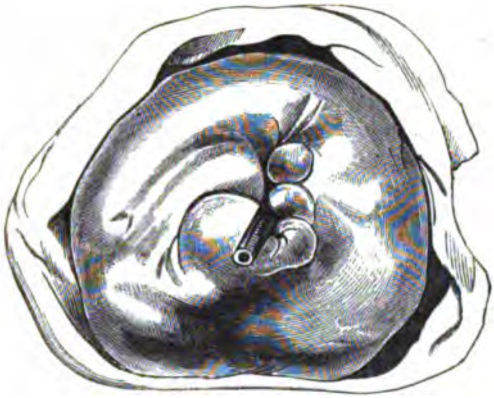
Fig. 563.



Hypertrophy of both lobes of the prostate.

the gland in its antero-posterior diameter, with a mammillated appearance at its posterior extremity, seemingly dependent upon an irregular condition of the middle lobe.

Fig. 564.



Hypertrophy of the prostate.

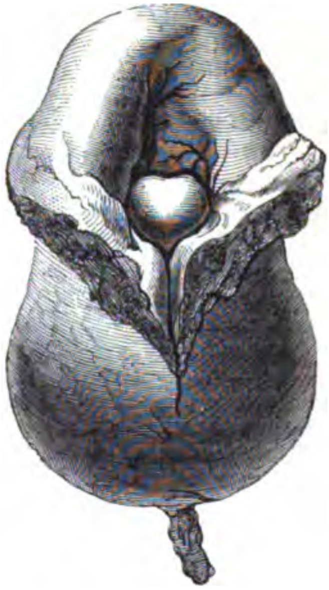
When one lateral lobe is more enlarged than the other, the more bulky one frequently encroaches upon the smaller, and thus produces a lateral curvature in the neck of the bladder and the commencement of the urethra.

Whatever may be the shape of the abnormal masses, or the direction in which the hypertrophy occurs, their surfaces, both external and internal, are either perfectly smooth, or they are irregular, knotty, and even lobulated.

When the middle lobe is hypertrophied, it generally forms a kind of mammillary process, more or less vertical in its position, and ranging in size from that of the female nipple to that of an almond, as seen in fig. 565. The apex of the tumor is free and rounded, while the base is immovably fixed, resting as it were upon the posterior extremity of each lateral mass. Its position is usually median, but it projects towards the bladder, drawing up the prostatic portion of the urethra and elongating the verumontanum.

The *consistence* of a hypertrophied prostate is liable to considerable diversity, and occurs under two very opposite forms, the hard and the soft. In the first, which is the more frequent, the induration varies from the slightest increase of the natural consistence to the firmness of fibrous tissue. Interspersed through its substance are numerous granulations. In the soft variety, the enlargement proceeds in a more uniform manner, and attains, as a general rule, a greater magnitude than in the hard. The affected tissues are more or less elastic, and yield readily under the pressure of the finger. The granulations are larger and more conspicuous than in the first variety. The nature of these granulations is not well ascertained. It is highly probable, however, that they are nothing but the terminal follicles of the prostate in a state of enlargement and partial occlusion.

Fig. 565.



Hypertrophy of the prostate, with mammillary enlargement of the middle lobe.

Hypertrophy always arises under the influence of *causes* which act in a slow and permanent manner. Whatever, therefore, has a tendency to keep up habitual engorgement in the organ may be considered as being capable of producing the affection. Augmented action necessarily occasions an augmented afflux of blood, and a corresponding increase of nutrition. Diminished action has a reverse effect. Amongst the more frequently enumerated causes of the malady are, excessive venery, stricture of the urethra, disease of the bladder, horseback exercise, gonorrhœa, and the employment of stimulating diuretics; but, in general, the influence of these causes is imaginary rather than real. They are, no doubt, all capable of inducing the disease; but, on the other hand, it is equally certain that they are often accused when they are entirely innocent. Some of the very worst cases of hypertrophy of the prostate occur in old men who have led the chastest life, who have not rode on horseback for forty or fifty years, and who have never had the slightest disease of the urethra.

The senile form of the lesion rarely takes place, at least not in any considerable degree, before the fiftieth year; slight evidences of it are occasionally met with at forty-five, and, indeed, even at forty, but this is exceedingly rare. Hypertrophy, not the result of old age, may occur at any period of life, under the influence of inflammatory excitement and vascular engorgement.

The influence of old age in the production of hypertrophy of this organ has been greatly overrated, as will appear from the subjoined table of 312 examinations made at my request by my friend, Dr. John W. Lodge, in 1859, while resident physician at the Philadelphia Hospital.

Number.	Age.	Normal.	Hypertrophied.	Atrophied.
23	40 to 50	21	2	....
94	50 to 60	73	18	3
113	60 to 70	84	27	2
64	70 to 80	53	11	....
15	80 to 90	12	3	....
3	90 to 100	3	....	....
Total . 312		246	61	5

In 100 dissections of the prostate gland after the age of sixty, by Dr. J. C. Messer, hypertrophy was found in 35 per cent., atrophy in 20 per cent., and normality in 45 per cent. These results essentially coincide with those of Mr. Henry Thompson, who has ascertained that this gland is hypertrophied in 35 per cent. after the fiftieth year.

Irritation of the neck of the bladder, and a frequent desire to pass the urine, are the *symptoms* which generally first attract the attention of the patient. By degrees, the distress at the neck of the bladder becomes more constant, as well as more severe, and there is not only a frequent desire to void the urine, but great difficulty in starting it. Slight pain is felt along the urethra, accompanied by a burning, smarting, or scalding sensation in the head of the penis, and a copious discharge of prostatic fluid. The rectum never feels entirely empty, even after the most thorough purgation, but as if it contained a lump or ball, and the feces are often passed in a flattened form. At night the patient is occasionally disturbed by an involuntary discharge of seminal fluid. As the disease advances, the symptoms become more aggravated, though they are still essentially of the same character. The general health, which until now was, perhaps, tolerably good, slowly declines.

The urine, at first perfectly clear, and, to all appearance, natural, becomes gradually changed in its properties, and sometimes even in its quantity. It is generally thick, fetid, acrid, and highly alkaline, depositing, on standing, a great abundance of thick, ropy mucus, often streaked with phosphatic matter. The fluid is soon decomposed, if, indeed, it is not so before it is voided, and then always exhales a strong ammoniacal odor. Gradually micturition becomes more and more difficult, and, at last, after months and perhaps years of the most cruel suffering, the urine is either retained, or has to be drawn off constantly with the catheter.

As hypertrophy is a disease almost peculiar to advanced life, when an individual who has attained the age of fifty, fifty-five, or sixty, is laboring under the train of symptoms above enumerated, the presumption is strong that the case is one of chronic enlargement of this body, and nothing else. The affections with which it is most liable to be confounded are, stricture of the urethra, urinary calculi, catarrh of the bladder, and stricture of the rectum. All, however, that is necessary in any case to determine the diagnosis, is a digital examination of the rectum. For this purpose, the left index-finger, gently inserted into the gut, is moved about in different directions, first upwards along the median line, and then successively towards each side, noting, as it proceeds, the impression made upon it by the affected gland. In general, it will be found, as before stated, to be larger on one side than the other, and to feel like a hard, solid body, the surface of which is either smooth and uniform, or irregularly knobby.

The *effects* of hypertrophy of this gland upon other parts of the urinary apparatus are frequently very distressing. The organ which is most liable to suffer is the bladder, the muscular coat of which becomes greatly thickened, and fasciculated from the constant obstacle to the evacuation of the urine. For the same reason, the mucous membrane is always chronically inflamed, and sometimes mammillated, ulcerated, or protruded across the intervals between the enlarged muscular fibres. Another effect is the occasional formation of urinary calculi.

The urethra, during the progress of the disease, often undergoes important changes. These changes are exclusively limited to the prostatic portion of the tube, which, in the more aggravated forms of the hypertrophy, is nearly always remarkably elongated. In enlargement of the middle lobe, the urethra is dragged up behind the pubic arch. Lateral curvature of the canal is occasionally met with, being generally dependent upon an unequal outgrowth of the inner edges of the lateral lobes.

The ureters are seldom sound. The most common lesion is dilatation of their caliber, with irregular thickening or attenuation of their walls.

The kidneys often sympathize in the disorganization of the prostate, or, rather, in the changes which it induces in the bladder and the ureters. As a natural consequence, they soon become inflamed, and more or less altered in their size, shape, and structure.

The seminal vesicles are liable to suffer, and it rarely happens that the rectum is not implicated. Prolapse and hemorrhoids are not uncommon.

In entering upon the *treatment* of this affection, we have to lament the impotency of our art, and the limited nature of our therapeutic resources. These remarks are particularly true of the senile form of the complaint, which hardly ever yields to any mode of management, however judiciously devised or perseveringly employed.

General depletion is very rarely indicated in this variety of prostatic disease. If, however, the patient is plethoric, the enlargement considerable, or the sympathetic reaction great, no remedy will be so likely to afford prompt and decided relief as a full bleeding at the arm. The detraction of blood should always, in the more aggravated varieties of the complaint, be speedily followed by the use of the antimonial and saline mixture, in the hope of subduing the action of the heart, unlocking the secretions, and clearing out the bowels. All irritating, heating, or griping cathartics, must here, as in most other affections of the prostate, be proscribed. At the same time, it must be borne in mind that an overloaded state of the bowels is never permissible. Sulphate of magnesia, or jalap and bitartrate of potassa, by rendering the feces soft and watery, are particularly well adapted to cases of such a nature. When manifest disorder of the biliary secretion exists, a few grains of calomel will usually prove serviceable. The food should be perfectly plain, easily digestible, unirritating, and well masticated. Condiments, wine, brandy, and fermented drinks are, in general, highly prejudicial. Unless strict attention be paid to these rules, no reasonable hope even of temporary amendment need be indulged. All exciting causes of the disease are to be carefully avoided. Above all, it is necessary that the patient should abstain from horseback exercise, and from sexual intercourse.

Repose in the horizontal posture is hardly less important here than it is in the more acute affections of the prostate. By this remark it is not, of course, meant that the patient shall confine himself constantly to his bed, and avoid all exercise; on the contrary, he should not neglect, whenever the weather is pleasant, to move about for a few hours every day in the open air, either on foot or in an easy carriage. When in the house, he may lie upon a lounge, or recline upon an easy chair, with a movable back.

For the purpose of acting directly upon the gland, and thereby lessening its volume, various remedies have been proposed. Among the more important of these are iodine and its different combinations, cicuta, mercury, hydrochlorate of ammonia, local depletion, and counter-irritation by issue, seton, blister, and tartar emetic pustulation. Of these remedies it may be observed, in general terms, that their efficacy has been fully tested by different observers, and that they are all to be regarded merely in the light of palliatives.

Iodine is more especially indicated in those cases in which the hypertrophy, caused by a syphilitic taint of the system, or an effusion of lymph, is characterized by rapid progress. The best form of exhibition is Lugol's solution, or the iodide of potassium, either alone or in union with iodide of iron and a minute quantity of bichloride of mercury. This remedy should be continued for a length of time, with occasional intermissions for a few days, to afford the stomach a short respite.

Cicuta has been a favorite remedy in the treatment of this affection. Administered in combination with other articles, it may occasionally prove beneficial.

I have not found that *mercury*, exhibited with a view to its constitutional effects, is capable of exerting any particular influence over this disease. Nevertheless, in obstinate cases, where other means have failed, I should not hesitate to resort to it. Ptyalism should, of course, be avoided. From three to five grains of blue mass, with one grain of extract of cicuta, should be given three times daily, until the gums are slightly touched. The medicine is then to be discontinued until the primary impression begins to subside, when it may again be resumed and exhibited as before. When an alterant plan of treatment is required, as when the enlargement has been produced by a syphilitic taint of the system, the mercury may advantageously be administered in union with iodide of potassium. Under such circumstances, the bichloride, cyanuret, or biniodide are preferable to calomel and blue mass. Donovan's solution is also worthy of trial.

Hydrochlorate of ammonia has long been familiar to the profession as a valuable remedy for the removal of visceral induration and enlargement. It may be exhibited, either alone or in combination with a minute portion of tartrate of antimony and potassa, in doses of ten, fifteen, or twenty grains several times a day.

There are few remedies which afford greater relief in this affection, whether the result of inflammatory action or of senile decay, than *leeching*. The blood may be taken either from the anterior wall of the rectum, or from the perineum and inside of the thighs. The plan which I usually adopt is to apply from four to six leeches to the perineum every fourth or fifth day.

Counter-irritation, by issue, seton, blister, and pustulation with tartar emetic ointment, is a valuable adjuvant in the treatment of chronic enlargement of the prostate. The choice of the remedy, and the place to which it is applied, must be regulated by circumstances. My favorite practice is to insert a small seton into the perineum.

Iodide of potassium, exhibited by the rectum, has been highly lauded in the treatment of this affection. The form in which it is administered is that of suppository, consisting of from three to five grains of the salt, with five grains each of extract of cicuta and hyoscyamus, introduced into the bowel night and morning. The strength of the remedies is gradually increased to ten grains. The treatment is continued for several months, and is aided by the daily use of he bougie, anointed with iodine ointment, composed of five grains of the salt o the drachm of simple cerate. The urine is drawn off every twelve hours with he catheter.

To allay the irritation of the bladder, which so frequently attends this disease, he warm bath, fomentations, opiate suppositories, and anodyne injections are ecessary.

Finally, the patient must pay particular attention to the time and manner in which he voids his urine. Micturition should not, on an average, be performed oftener than once every four hours. Moreover, he must avoid straining during he operation. To prevent accumulation of water, it frequently becomes necessary to draw it off at stated periods.

Injection of the bladder, as advised under the head of catarrh, frequently produces great relief, by dislodging the thick, ropy, and offensive mucus which so often collects in the bas-fond of this organ.

As means calculated to produce a direct impression upon the prostate, mention may be made here of cauterization, excision, incision, and crushing.

It is not easy to comprehend how *cauterization* acts in bringing about a diminution of the volume of a hypertrophied prostate, when it is remembered that it can be applied only to the mucous membrane of the urethra. The cauterization, if deemed advisable, is performed with a suitable instrument, as that delineated under the head of stricture of the urethra. It should not be repeated oftener than once a week, and any irritation following it should be combated by demulcent drinks, anodynes, recumbency, and the warm bath.

Scarification of the affected gland has occasionally been practised, and sometimes apparently with advantage. The operation, which gives rise to little or no pain, is performed with a curved lancetted stylet, similar to that used for dividing stricture of the urethra. It may be repeated about every fourth day, and is particularly worthy of trial when there is an unusual degree of irritability of the prostate.

Excision of the prostate has been recommended. It does not, however, appear that any one has really ever had the hardihood or folly to perform it. Excision of the middle lobe would be less objectionable.

Another operation for the relief of chronic enlargement of the prostate is *incision*. It is founded upon a knowledge of the relief occasionally afforded by the operation of lithotomy, performed upon persons affected with this complaint. Of the propriety and utility of this process, I am unable to speak from personal observation, but, judging from the results recorded by others, I am disposed to place little confidence in it.

The operation of *crushing* is applicable only to the middle lobe of the prostate. It was evidently originally suggested by the operation of lithotripsy, of which, in fact, it is merely a modification. It consists in seizing the enlarged body with the lithotrite, and grinding, squeezing, pressing, or mashing it into a soft, pulpy substance, which is detached partly by the instrument, and partly by the sloughing process, being afterwards discharged with the urine. The proceeding is best adapted to those cases in which the middle lobe, adhering by a small pedicle, rises up behind the mouth of the bladder in the form of a narrow, elongated valve. The operation is not attended with much pain, but it is liable to be followed by hemorrhage, severe inflammation, and even death, on which account it ought to be performed with great caution.

Perforation of the middle lobe of the prostate has been proposed when this body forms an insuperable barrier to the evacuation of the urine, whether by the natural efforts or by artificial means. The operation may be performed with a large trocar, inclosed in a silver canula, and curved like an ordinary catheter. The instrument is introduced in the usual manner, as far as the seat of the obstruction, where it is firmly held until the trocar is pushed across the base of the swelling into the bladder. The want of resistance will indicate that the transfixion has been completed. The trocar is then withdrawn, and the canula left in the bladder. In a few days this is also removed, and a large catheter substituted. In this manner the treatment is conducted until the new canal has become lined by mucous membrane, when the occasional passage of the catheter will suffice to prevent occlusion. In performing this operation great care [illegible] be taken to keep the instrument in the middle line, and at a proper [illegible] the one hand, from the arch of the pubes, and, on the other, from the [illegible]

5. ATROPHY.

The prostate, like other organs, is liable to atrophy. The affection [illegible] arises as an effect of senile decay, but more frequently it is the result of [illegible] compression and structural disease. The senile form is extremely rare [illegible] dom exists as a pure, uncomplicated affection. The extent of the [illegible] being sometimes limited to a portion of the gland, while, at other times [illegible] volves its whole body. It does not require any treatment.

6. PROSTATORRHŒA.

Prostatorrhœa, an affection which I have been the first to describe, [illegible] term implies, a discharge from the prostate gland, generally of a thin [illegible] character, dependent upon irritation, if not actual inflammation, of the [illegible] tissues of that organ; and hitherto confounded with other lesions, as [illegible] losses, gleet, and cystorrhœa, from which, in fact, it is often difficult [illegible] tinguish it.

Prostatorrhœa is rare in children and very young subjects, owing, no [illegible] to the remarkably dormant condition of the genito-urinary organs in [illegible] That it may occur, however, even at a very tender age, is very certain, [illegible] in children laboring under stone in the bladder, prolapse of the bowel, or [illegible] in the rectum, causing reflected irritation. After the twentieth year the [illegible] is sufficiently common, and instances are occasionally witnessed even in [illegible] persons. As long as the prostate gland remains small and inactive, or [illegible] brought fully under the influence of the genital apparatus, with which [illegible] intimately associated, it is comparatively infrequent.

All classes of persons are liable to this affection; but it has seemed to [illegible] be most frequent in those of a sanguineo-nervous temperament, with [illegible] sexual propensities, leading to frequent indulgence of the venereal [illegible] not to positive venereal excesses, whether in the natural manner or by [illegible]bation. An irritation is thus established in the organ, attended with [illegible] less discharge of its peculiar secretion, normal or abnormal. Single and [illegible] men are, apparently, equally prone to it. Intemperance in eating and [illegible] frequent horseback exercise, sexual abuse, and disease of the bladder, [illegible] rectum, may all be regarded as contributing to its production and [illegible]

The exciting *causes* are not always very evident. In most cases the [illegible] is traceable, either directly or indirectly, to venereal excesses, chronic [illegible]tion of the neck of the bladder, stricture of the urethra, or disease of some [illegible] or other of this canal. Sometimes it has its origin in disorder of the lower [illegible] as hemorrhoids, prolapse, fissure, fistule, ascarides, or the lodgment of some [illegible] body. It is easy to conceive how reflected irritation might induce this [illegible] The connection between the prostate gland and ano-rectal region is very [illegible] and intimate, and, therefore, whatever affects the one will almost be sure, [illegible] time, to implicate the other, either from proximity of structure, or as an effect [illegible] sympathy. Temporary prostatorrhœa is occasionally excited by the [illegible] of internal remedies, as drastic cathartics, cantharides, and spirits of [illegible] or, in short, whatever has a tendency to invite a preternatural afflux of blood [illegible] the prostate gland, the neck of the bladder, or the posterior portion of the [illegible] Another cause of the disease, especially in young men, is masturbation or [illegible] pollution. Many of the most obstinate and perplexing cases of it that have [illegible] under my notice were the direct result of this detestable practice.

The *symptoms* are sufficiently characteristic. The most prominent is a [illegible] charge of mucus, generally perfectly clear and transparent, more or less [illegible] and of varying quantity, from a few drops to a drachm and even upwards, [illegible] twenty-four hours. It is seldom puriform, and still more rarely purulent. [illegible] considerable, the flow keeps up almost a constant moisture at the orifice of the urethra, and it may even make a decided impression upon the patient's linen, leaving it wet and stained, as in gleet or gonorrhœa, though in a much less degree. The most copious evacuations of this kind generally occur when the patient is at the water-closet, engaged in straining, especially if the bowels are constipated, or the rectum is distended with hard fecal matter so as to exert an unusual amount of pressure upon the prostate gland.

The discharge, whether small or large, is often attended with a peculiar tickling sensation in the prostate gland, from which it frequently extends along the whole length of the urethra, and even to the head of the penis. In many cases the feeling is of a lascivious, voluptuous, or pleasurable nature, not unlike that which accompanies the earlier stages of sexual intercourse. Very often there is a "dropping sensation," as if the fluid were falling from the prostate gland into the urethra. Other anomalous symptoms sometimes present themselves, as a feeling of weight and fatigue in the region of the prostate, anus, and rectum, or along the perineum, with, perhaps, more or less uneasiness in voiding urine, and a frequent desire to empty the bladder: some patients are troubled with morbid erections and lascivious dreams.

It is astonishing how much the patient's mind suffers in this affection. The discharge, even if ever so insignificant, occasions him the greatest possible disquietude; for at one time he imagines that it is a source of much bodily debility, or that it is productive of weakness and soreness in the dorso-lumbar region, especially if these symptoms happen to coexist; at another, that he is about to become impotent, under the delusive idea that the flow is one of a seminal character, an idea which not unfrequently haunts him day and night, and from which hardly anything can, perhaps even temporarily, divert his attention. His mind, in short, is poisoned, and the consequence is that he is incessantly engaged in trying to obtain relief, running from one practitioner to another, distrusting all, and affording none an opportunity of doing him any good. In the worst forms of the affection, his business habits are destroyed, he becomes morose and dyspeptic, and he literally spends his time in watching for the discharge which is the source and cause of his terrible suffering.

The affections with which prostatorrhœa may be confounded are the various forms of urethritis, especially gleet or chronic gonorrhœa, discharges of semen, and chronic inflammation of the bladder.

From *urethritis*, whether common or specific, it is generally easily distinguished by the history of the case, the nature of the discharge, and the attendant local phenomena. In most cases, the affection comes on gradually, not suddenly, as in gonorrhœa or simple inflammation, without impure connection; the discharge is white or grayish, translucent, and ropy, not purulent, opaque, and yellowish; and there is ordinarily no burning or scalding in micturition. Moreover, there is seldom any evidence of inflammation in the urethra or penis. In gleet the signs of distinction are sometimes more difficult; but even here a satisfactory conclusion may generally be reached by a careful consideration of the history of the case, and by a proper examination of the discharge, which is nearly always more or less puriform, as well as more abundant than in prostatorrhœa. When the discharge from the urethra is kept up by the presence of a stricture, the diagnosis can only be determined by a thorough exploration with the bougie.

Patients are apt to confound this discharge with a *flow of semen;* an idea in which they are often encouraged by their attendants, from ignorance of the nature of the affection. Much has been said and written respecting diurnal spermatic emissions; but, according to my experience, such evacuations are extremely rare. We are often told that they take place at the water-closet, during efforts at straining, and this is, no doubt, occasionally the case; but more commonly they are of a strictly prostatic character, the fluid being forced out of its appropriate receptacles into the urethra, along which it is presently discharged. This delusion will be more likely to take hold of the mind if the escape of the fluid is accompanied by pleasurable sensations, somewhat similar to those which follow a feeble emission. Persons affected with prostatorrhœa will often insist upon it that they have quite a number of such evacuations—[illegible] many as six or eight—during the twenty-four hours, especially [illegible] troubled with disease of the ano-rectal region, leading to frequent [illegible] water-closet, or if they are much in female society, engaged in exciting [illegible] or addicted to luxurious living and to inordinate sexual intercourse, [illegible] in general and local debility. Should the history of the case fail to [illegible] requisite light, it may be promptly supplied by a microscopic examination [illegible] suspected fluid, semen always revealing numerous spermatozoa, [illegible] prostatic and urethral secretions never afford any such indications, or [illegible] sparingly. This will be the case whether the discharge be taken from [illegible] orifice of the urethra or from the stiffened spots left upon the patient's [illegible]

The characteristic symptom of *cystorrhœa*, or chronic inflammation [illegible] bladder, is an inordinate secretion of mucus, generally associated with [illegible] condition of the urine, frequent and difficult micturition, pain in the [illegible] the affected organ, as well as in the surrounding parts, and more or less [illegible] tutional disturbance. In prostatorrhœa there may also be more or less [illegible] ness low down in the pelvis, with trouble in voiding urine, especially [illegible] prostate is much enlarged, so as to cause constant vesical irritation [illegible] two disorders are so widely different as to render it impossible to confound [illegible]

The *pathology* of this affection consists in some disorder of the prostate [illegible] especially of its follicular apparatus, leading to an inordinate secretion [illegible] peculiar fluid, and to a discharge of this fluid by the urethra, at longer or [illegible] intervals, and in greater or less quantity. That this disorder is, at [illegible] real inflammatory nature, is extremely probable from the character of the [illegible] comitant phenomena, and also from the fact that this organ is frequently, [illegible] indeed not generally, found to be more or less enlarged and indurated. [illegible] theless, there are cases, and these are by no means uncommon, in which [illegible] all appearance, either entirely healthy, or so nearly healthy as to render [illegible] practicable, by the most careful exploration, to discover any departure from [illegible] normal standard. The discharge under such circumstances seems to be the [illegible] solely of a heightened functional activity, probably connected with, if not [illegible] dependent upon, disorder of the seminal vesicles, the urethra, neck of the [illegible] or recto-anal structures; in other words, upon reflected irritation, or sympathetic disturbance.

The *prognosis* of the disease is generally favorable. Its obstinacy, [illegible] is often very great, and the surgeon should, therefore, always be guarded [illegible] expression of his opinion respecting a rapid cure. When the mind [illegible] pathizes with the local affection, as is so frequently the case, especially [illegible] men of a nervous, irritable temperament, there is no disease which, according [illegible] my experience, is more difficult of management, or more likely to result [illegible] tion and disappointment.

In the *treatment* of this affection, the surgeon must inquire, first, into the [illegible] dition of the prostate gland and its associate organs, and, secondly, [illegible] patient's habits and the state of his health.

To attain the first of these objects, recourse must be had to the catheter, [illegible] by the finger in the rectum, previously emptied by an enema. In this [illegible] we become at once apprised of the existence or non-existence of stricture [illegible] urethra, and of the presence or absence of morbid sensibility of its mucous [illegible] brane; also of the size and consistence of the prostate, and the state of the [illegible] reservoir, particularly as to whether there is inflammation, stone, hyper[illegible] or other lesion. The finger, inserted into the rectum, will be of great service [illegible] only in detecting disorder in the prostate and bladder, but also in this [illegible] itself, as well as in the anus. If disease of the seminal vesicles exists, it [illegible] usually be evinced by tenderness on pressure through the wall of the [illegible] provided the finger is sufficiently long or the prostate is not too voluminous.

The patient's habits must be corrected. In general, it will be found that [illegible] is very lascivious, and guilty of venereal excesses, thus keeping the prostate gland, the seminal vesicles and adjoining structures in a continual state of [illegible] citement, highly favorable to the production of prostatorrhœa. His health [illegible] often below the natural standard; his sleep and appetite are impaired, and his bowels are, for the most part, constipated.

In the majority of cases, the patient is weak, or deficient in muscular and digestive power, indicating a necessity for tonics, as iron and quinine, a nutritious diet, with a glass of generous wine, and gentle exercise in the open air, either on foot or in an easy carriage. Riding on horseback should be scrupulously avoided, as it is likely to keep up undue excitement in the parts. Perhaps the best preparation of iron is the tincture of the chloride, in union with tincture of nux vomica, in the proportion of twenty drops of the former to ten of the latter, four times a day. If the patient is plethoric, he may use with great advantage small doses of tartar emetic in the form of the antimonial and saline mixture. In either case, it is of paramount importance to correct the secretions and to maintain a soluble condition of the bowels. Drastic purgatives are, of course, avoided, as they would only tend to perpetuate the mischief. Unless the patient is actually debilitated, he should rigorously abstain from condiments and high-seasoned dishes.

Among the more important topical remedies are, first, moderate sexual indulgence, as a means of allaying undue excitement of the prostate and its associate organs; and, secondly, cooling and anodyne injections, or weak solutions of nitrate of silver and laudanum, or, what is generally preferable, Goulard's extract with wine of opium, in the proportion of one to two drachms of each to ten ounces of water, thrown up forcibly with a large syringe three times a day, and retained three or four minutes in the passage. In obstinate cases, cauterization of the prostatic portion of the urethra, or even of the entire length of this tube, may be necessary, the operation being repeated once a week. The cold hip-bath is used twice in the twenty-four hours; the lower bowel is kept cool and empty; and, if the disease does not gradually yield, leeches are applied to the perineum and around the anus.

Whatever plan of treatment may be employed, perseverance and an occasional change of prescription are indispensable to success. When there is deep mental involvement, hardly anything will effect a cure; or, more correctly speaking, it will be almost impossible to induce the patient to believe that he is well, or that nothing serious is the matter with him. Under such circumstances our chief dependence must be upon travelling and an entire change of scene and occupation. If the patient is single, matrimony should be enjoined.

7. HETEROLOGOUS FORMATIONS.

The heterologous formations of the prostate are extremely uncommon. The most frequent, undoubtedly, is encephaloid, but even this is very rare. It has hitherto been observed chiefly in advanced life, though no period seems to be exempt from it.

There are no signs by which *encephaloid* can be distinguished, with any clearness, from some of the other affections to which this body is liable. The most reliable evidences are, a discharge of blood with the urine, the occasional expulsion of cerebriform substance or organized clots, the frequent desire to pass water, and the ability to feel the enlarged gland through the rectum. No kind of treatment, either local or general, is of any service beyond palliation.

Of *scirrhus* of this gland nothing is known, and the same is true of colloid and melanosis. Their occurrence is extremely rare, and, excepting the latter, I have never met with them in this situation. In the case referred to, the black deposit existed in the bladder, and in almost every other organ of the body, without any suspicion, during life, of its presence in the urinary apparatus. The patient was a man, fifty-eight years of age.

The prostate gland is occasionally the seat of *tubercles*. The affection, however, is also extremely rare, and is usually, if not invariably, associated with similar deposits in the seminal vesicles, urinary bladder, kidneys, testicles, and other organs. The malady is most common between the twenty-fifth and fifty-fifth years. In eighteen cases analyzed by Mr. Henry Thompson, in his excellent work on the Prostate Gland, the age of the youngest subject was eleven [illegible] the oldest seventy-six years.

The disease furnishes no characteristic symptoms, and every attempt to [illegible] it upon scientific principles must prove unavailing. When its existence is suspected, iodine may be administered internally, and counter-irritation [illegible] the perineum.

8. CYSTIC DISEASE.

Cysts occasionally exist in the prostate, but their occurrence is extremely rare. They vary very much in size and number, but are usually quite [illegible] Their contents are transparent, fluid, and of a serous character. Their [illegible] origin has not been determined. They are, probably, merely dilated [illegible] follicles, or expanded and closed excretory ducts. Old persons are most [illegible]ious to them.

9. FIBROUS TUMORS.

Fibrous tumors of the prostate vary in their volume from that of a pea [illegible] of a small almond; they are of a spherical, or ovoidal form, of a firm [illegible] consistence, and of a dull, grayish color. They are usually situated on the [illegible] surface of the gland, but occasionally they project inwards, so as to [illegible] upon the urethra and the neck of the bladder. They commonly grow by a broad base, and a section of them displays a grayish, drab-colored tissue, tough, inelastic character, having little moisture, and but few vessels. Their existence may be suspected, but cannot positively be affirmed, during life.

10. HEMORRHAGE.

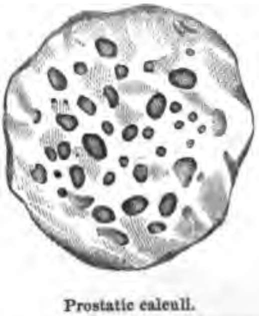
The prostate gland is liable to hemorrhage, varying in degree from a few [illegible] to several ounces. The occurrence, however, is very rare, and is chiefly [illegible] in aged subjects, in consequence of the forcible use of instruments. Sometimes the most gentle catheterism will be followed by a smart flow of blood. The [illegible]tation of a calculus may also give rise to it.

The prognosis is favorable or otherwise, according to the cause of the hemorrhage, as, for example, whether it is simple or traumatic, or dependent on ulceration of the gland, or the presence of malignant disease. The treatment [illegible] to be conducted upon the same principles as that of hemorrhage of the urinary passages generally.

11. CALCULI.

The prostate, like the bladder and the kidney, is liable to the formation of calculi, as seen in fig. 566, which generally become a source of severe suffering, imperatively demanding surgical and other interference. They are entirely different, both in their structure and composition, from vesical concretions, and appear to be the result, at least in some instances, of disorderd follicular secretion, dependent, in all probability, upon subacute or chronic irritation. Old persons are most prone to their formation; they may, however, occur at almost any period of life.

Fig. 566.

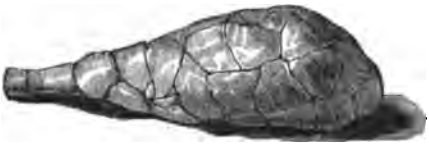


Prostatic calculi.

The number of concretions is extremely variable; sometimes there is only one, while, at other times, there are so many as to render it difficult to count them. Their volume is generally in proportion to their number. Composed exclusively of phosphate of lime, they are of a spherical or ovoidal shape, of a firm consistence, and of a grayish, whitish, or brownish color. From a careful examination of their situation, in different stages of their development, I am led to believe that they are originally formed in the follicles and ducts of the prostate, from which they either escape, or they remain, and gradually destroy its substance.

A very remarkable case of prostatic calculus, delineated in fig. 567, has been described by Dr. Herbert Barker, of England. Its weight was three ounces and a half, its length nearly five inches, and its circumference, at the thickest part, four inches and five-eighths. It had a rough, lobulated surface, and consisted of twenty-nine distinct pieces, clearly showing that it had been originally deposited in separate cells of the prostate, the intervening structures of which had been absorbed during the progress of its formation.

Fig. 567.



Prostatic calculus.

There is no uniformity in the *effects* produced by these bodies. When small, they seldom cause much uneasiness, sometimes, indeed, not the slightest. At times, however, they are productive of great inconvenience, if not of excessive suffering. One of the most common occurrences is a dull, aching, wandering pain, with a sense of uneasiness in the perineum and neck of the bladder. The general symptoms do not differ materially from those which accompany stone in the bladder.

The *diagnosis* of this affection is by no means always easy. When the finger is introduced into the rectum, the prostate being at the same time pressed backwards with a large sound, the concretions may often be felt as so many hard, irregular projections, the position of which remains unchanged by any force that may be applied to them. When a considerable number are collected together, as it were, in a nest, they impart to the finger the feel of a bag of marbles, of a mass of clotted blood, or of a bag of air. Another sign upon which great reliance is to be placed, is the circumstance that the concretions can be felt only in one particular spot, and that they are generally more or less immovably fixed.

Prostatic calculi are usually associated with disease of the urinary apparatus, as stricture of the urethra, hypertrophy of the muscular coat of the bladder, vesical calculi, and disorganization of the ureters and kidneys. The prostate itself is variously affected; generally, it is atrophied, and partially sacculated.

In the *treatment* of prostatic calculi, the general health must be attended to; and any complications that may exist must be met upon ordinary principles. To counteract the tendency to phosphatic deposits, the different acids, especially the nitric, must be put in requisition, either singly or combined with infusion of uva ursi and hops. Alkalies are also sometimes indicated.

The radical treatment, which, of course, is purely mechanical, must be regulated by circumstances. When the calculi project into the urethra, they sometimes admit of being detached with instruments, and pushed back into the bladder, or an attempt may be made to extract them with Weiss's forceps. When they are encysted, or contained in a bag in the parenchymatous substance, the only way is to cut down to the organ upon a staff, as in the ordinary lateral operation of lithotomy; or, if this cannot be done, the median operation may be performed. Occasionally, the calculi lie in the cellular substance between the prostate and the rectum; and, when this is the case, an incision may be made through the bowel, previously well dilated with the speculum.

12. SACCIFORM DISEASE AND FISTULE.

In consequence of abscess, ulceration, gangrene, or the presence of calculi, a pouch, sometimes as large as a pullet's egg, is liable to form in the prostate gland, at the expense of its proper substance, its fibrous capsule alone remaining. In the majority of cases it communicates by a pretty large orifice directly with the bladder, so that, if a catheter is passed along the urethra, it is very apt to become arrested in it. Occasionally it opens into the rectum or upon the surface of the perineum, or in both situations, although this is very uncommon.

A person thus affected experiences more or less pain and difficulty in voiding his urine, which is generally mixed with pus and thick, ropy mucus; there is constant uneasiness in the pelvic region, the general health suffers, and the slightest exposure, fatigue, or disorder of the bowels, is sure to aggravate the local distress. When the sac communicates with the bowel there may be an interchange of urine and fecal matter between the two reservoirs. Sometimes there is incontinence, at other times retention, of urine. The diagnosis can only be established by a thorough exploration with the catheter, aided by the finger in the rectum. The prognosis is unfavorable, as few cases admit of relief by treatment. When the suffering is very great, the best plan would be to divide the parts freely, as in the recto-vesical operation of lithotomy.

CHAPTER XVIII.

DISEASES AND INJURIES OF THE MALE GENITAL ORGANS.

SECT. I.—AFFECTIONS OF THE TESTICLE.

THE testicle is liable to wounds, inflammation, abscess, hypertrophy, atrophy, serous cysts, tuberculosis, encephaloid, scirrhus, melanosis, colloid, hydatids, and neuralgia.

1. *Congenital Irregularities.*—One of the testicles is sometimes absent, the increased size of the other generally atoning for the deficiency. A few instances only, of a well authenticated character, are upon record in which both organs were wanting. Sometimes one testicle is unusually small, and the other uncommonly large. I have met with two cases in which these structures seemed to exist simply in a rudimentary state, their volume hardly equalling that of a hazelnut. One of the men never experienced the slightest sexual desire; the other, however, had been married, but, although the connection had lasted upwards of twenty years, no offspring had followed. A supernumerary testicle occasionally exists, but, in general, what is regarded as such an appendage is merely a fatty or fibrous tumor of the scrotum.

Anomalies of *situation* of the testicle sometimes occur. Of these the most common is the retention of the organ in the groin, or in the inguinal canal; more rarely it remains in the cavity of the abdomen. The defect may be limited to one organ, or it may involve both; and, what is singular, we now and then see examples of it in several members of the same family, as in a remarkable instance reported by me in the Western Journal of Medicine and Surgery, for May, 1841. In time—generally towards the age of puberty, or soon after—the organ passes down into the scrotum, but the cases are not uncommon where the retention is permanent. Besides being a source of pain and annoyance in such an event, from the compression of the abdominal muscles and other causes, the organ is prone to take on encephaloid disease and to induce hydrocele and hernia. It is asserted that an undescended testicle is incapable of forming spermatozoa. If hernia should occur, the protruding parts, instead of issuing at the external ring, are very apt to be deflected out towards the anterior superior spinous process of the ilium, thus constituting, strictly speaking, an inguinal hernia or bubonocele.

The tumor formed by an undescended testicle is liable to be mistaken for hernia; but from this it may generally be easily distinguished by its greater solidity, by the empty state of the scrotum, by the absence of impulse on coughing, and by the peculiar pain felt on handling the parts. When the tumor coexists with hernia the symptoms will be of a mixed character.

The *treatment* of retained testicle varies. When the organ lies in the groin, an attempt should be made by daily and long-continued tractions with the fingers, aided by gymnastic and other exercises, to get it into the scrotum. If it is only partially down, and there is at the same time a hernia, a truss with a small pad should be worn, the pressure being applied above the retained organ, which may then be gradually urged down by the means just mentioned. Nothing, of course, can be done when the testicle is retained in the abdominal cavity. When the gland suffers excessive pain from the incessant compression of the abdominal muscles, extirpation may become necessary.

Instead of being retained in the groin, the testicle sometimes descends into the perineum, lying at the root of the scrotum, near the anus, or close by the tuberosity of the ischium. Such an anomaly always constitutes a serious evil, as it must necessarily be attended with great inconvenience and risk of injury when the subject of it sits, or rides on horseback.

Eckart and Vidal each relate an instance where one of the testicles, instead of passing through the inguinal canal, emerged at the femoral ring; and Curling refers to one in which this gland was lodged behind the saphenous vein, in the upper and inner part of the thigh, about three inches below Poupart's ligament. It was small and undeveloped. Finally, the position of the testicle in the scrotum is sometimes reversed, the free surface presenting posteriorly, while the anterior part of the organ is connected with the epididymis.

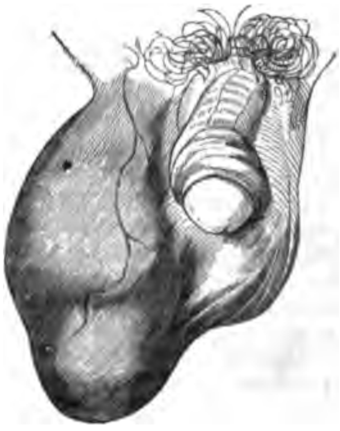
2. *Wounds.*—Wounds of the testicle may be of various kinds, as incised, contused, punctured, lacerated, and gunshot; their occurrence is uncommon, and their treatment does not differ from that of similar lesions in other parts of the body. Great care should be taken to save as much structure as possible. When the wound extends through the spermatic cord serious hemorrhage may arise, and it should, therefore, be the duty of the surgeon to seek for and tie every bleeding vessel. A violent contusion of the testicle has been known to be followed by convulsions and death.

Wounds of this organ are liable to be followed by atrophy. In a case which occurred in the Crimean war, and in which a very slight injury had been inflicted by the fragment of a shell, the testicle had nearly entirely disappeared at the end of five months by absorption. The other organ was also diminished in bulk, although it did not seem to have been hurt in the first instance. A similar phenomenon was noticed by Jobert in some of the persons that were wounded in the insurrection at Paris, in July, 1830.

3. *Orchitis.*—Inflammation of the testis, technically called orchitis, may be acute or chronic, idiopathic or traumatic, primary or consecutive, common or specific. For an account of the syphilitic form of the affection, the reader is referred to the chapter on syphilitic diseases in the first volume.

The acute form of common orchitis is seated principally in the epididymis, and is generally caused by gonorrhœa, the inflammation being transmitted from the urethra along the deferent duct. It may also be occasioned by external violence, great sexual excitement, the effects of cold, and by metastasis, as in mumps. During the existence of gonorrhœa, the most trifling circum-

Fig. 568.

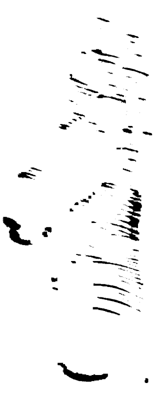


Acute orchitis.

[illegible] exposure to wet [illegible] The epididymis [illegible] and the tunica vaginalis [illegible] with flakes of lymph. The [illegible] increased in size. The [illegible] pressure; the pain [illegible] extends upwards in the [illegible] is often very severe [illegible] fever is present, frequently [illegible] drawn from the arm [illegible] The discharge from the urethra [illegible] and the patient is often annoyed [illegible] In many cases great uneasiness [illegible] and inner part of the thigh. When [illegible] follows gonorrhoea [illegible] of the fourth week [illegible] as well as [illegible] successively.

[illegible] inflammation and the [illegible] especially [illegible] signs of [illegible] the body [illegible] pain produced [illegible] purgative [illegible] will probably [illegible] From the close proximity [illegible] inflammation may readily be propagated [illegible] separately [illegible] terminating [illegible]

[illegible] If the patient is young [illegible] evacuated [illegible] is given in [illegible] the scrotum [illegible] with the lead and [illegible] patient are often [illegible] advantage [illegible] position [illegible] perineum of the [illegible] are applied directly to the [illegible]



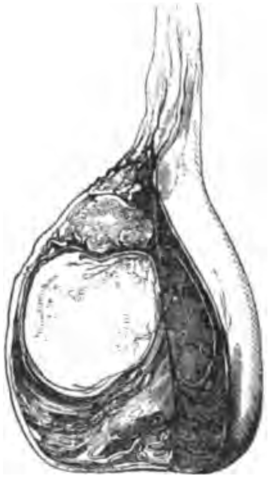
When the swelling is very large, tense, and [illegible] should be made to afford [illegible] which whenever the disease [illegible] is always present in greater or less quantity [illegible] to the patient's sufferings. In performing [illegible] the testicle is grasped at its lower and [illegible] with the left hand, while with the right a narrow [illegible] is plunged perpendicularly into the [illegible] and in front. The want of resistance [illegible] will indicate that the instrument [illegible] proper depth. If prompt and decided [illegible] the knife is reintroduced [illegible] freely, at one or more *points* the [illegible] in order to remove the excessive pressure [illegible] the inflamed and sensitive tubules of the [illegible]. Such an operation, however, will seldom be [illegible]

As soon as the disease loses its acute character and [illegible] under the above measures in three or four the gums should be gently touched with mercury, and the affected part compressed with a series of strips of adhesive plaster, each about six lines in width, and eight inches in length. The strips are applied as in fig. 569, which explains the process much better than any formal description. The first is placed circularly round the cord, just above the epididymis, as tightly as it can be borne; the second slightly overlaps the first, the third the second, and so on until the whole tumor is enveloped down to its base, when five or six vertical strips complete the dressing.

The patient usually experiences some degree of pain during and immediately after the operation, and should this not subside in an hour or two the compression must be discontinued. The strapping requires to be renewed every twenty-four hours. The advantage of this treatment is that, while it rapidly subdues the disease and promotes the absorption of effused fluids, the patient is able to walk about and attend to business.

4. *Suppuration and Abscess.*—Orchitis does not often pass into suppuration, much less into abscess. When matter is about to form, all the symptoms are suddenly aggravated; rigors come on, often attended with slight delirium; and the part is so painful as to be intolerant of the slightest manipulation and pressure. The pus, generally mixed with seminal fluid, is seldom of a healthy character; and, as it is confined by the albugineous coat, it is always a long time in reaching the surface. The abscess often breaks at several places, thus leaving unhealthy sores, which it is difficult to heal, and which not unfrequently lead to a total disorganization of the tubular structure. Suppuration of the testicle is most common in scrofulous subjects, and in persons affected with tertiary syphilis. The matter is sometimes encysted, as in fig. 570. When pus forms as a consequence of ordinary epididymitis, it is generally situated in the vaginal tunic, and not in the substance of the testicle.

Fig. 570.

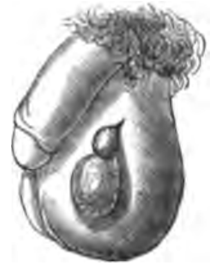


Abscess of the testicle.

The *treatment* consists in an early incision, or, rather, in a delicate puncture, especially when the fluid is situated in the substance of the testicle, the object being to save texture. The retention of pus in the parenchymatous tissue of the gland must be carefully guarded against, as being calculated to do immense harm by disorganizing the tubular structure.

When the matter is allowed to find a spontaneous outlet, the opening is very liable to become the seat of *fungus*, consisting of a mass of tubular substance and unhealthy granulations, as seen in fig. 571, from one of my clinical cases. When the protrusion is small, or of recent standing, it may occasionally be successfully repressed by regular, systematic compression with adhesive strips; or, instead of this, the edges of the opening may be thoroughly pared, and approximated by several points of the twisted suture. In the more severe and intractable cases, the mass must be retrenched with the knife or scissors; this failing, castration must be performed, an operation which is the more proper, because the substance of the testicle is, under such circumstances, generally completely destroyed, as I have satisfied myself by dissection.

Fig. 571.



Fungus of the testicle.

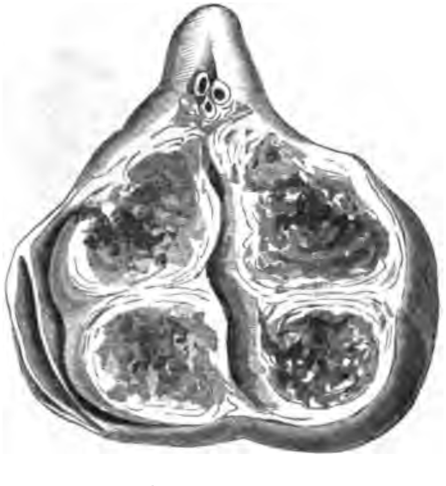
5. *Chronic Orchitis.*—Chronic inflammation of the testis may arise spontaneously, or succeed an acute attack. The most frequent exciting causes are gonorrhœa, stricture of the urethra, chronic cystitis, and hypertrophy of the prostate gland. The disease is characterized by induration and swelling, which,

beginning in the epididymis, where they are always most conspicuous, gradually extend to the body of the testis, forming a tumor four or five times the normal bulk, free from pain, and so slow in its advances as to escape notice until it has produced serious structural changes. This circumstance, together with the irregular shape of the tumor, is sufficiently diagnostic of the nature of the affection. The hypertrophy, which may occur on both sides, is liable to be followed by suppuration of the parenchymatous structure, hydrocele of the vaginal sac, and thickening of the cord. In obstinate cases, a section of the tumor exhibits a dense, fibrous texture, of a reddish or brownish color, interspersed with small cells. It was to this form of the disease that the term *sarcocele* was applied by the older surgeons.

In the *treatment* of this affection, the indications are to remove any exciting cause that may still be in operation, and to promote the absorption of the effused matter upon the presence of which the hypertrophy depends. To fulfil the latter, the patient is confined to his back, on light diet, and is slightly mercurialized. The best preparations for this purpose are calomel, blue mass, and protiodide of mercury, properly guarded with opium. The bowels are cleared out every other day with castor oil, sulphate of magnesia, or the black draught. Suspension of the scrotum is indispensable; and discutient lotions, tincture of iodine, and local depletion by leeches or punctures are important adjuvants. Ointments are usually hurtful. In some instances, I have derived great benefit from compression, applied as in acute epididymitis. If matter forms, it must be promptly evacuated; fungus is repressed by escharotics and the knife. Steady perseverance in this treatment for six or eight weeks is indispensable to a cure. Castration is unwarrantable, unless malignant action supervenes, which is not probable.

6. *Fibrous, Cartilaginous, and Osseous Degeneration.*—The substance of the testicle, in consequence of protracted inflammation, occasionally undergoes the *fibrous* degeneration. The change probably begins in the internal cellular structure, which is gradually converted into white, grayish, or bluish filaments, narrow, dense, resisting, and interlaced in every conceivable manner. The new tissue interferes so much with the nutritive condition of the seminiferous tubes as to occasion, at first, a diminution in their size, and ultimately their entire destruction. When the transformation is complete, the organ is firm, solid, almost incompressible, and inelastic; it creaks under the knife, possesses very little moisture, and is nearly destitute of cellular substance. Small cysts, containing serous fluid, are occasionally interspersed through it, and specimens are observed in which there are tolerably large cavities filled with whitish, jelly-like matter. The tumor rarely exceeds the volume of a common-sized orange. The vaginal and albugineous tunics often preserve their natural characters. The disease has no tendency to return after removal. The annexed sketch, fig. 572, from a preparation in my collection, conveys a good idea of the peculiar structure of this morbid growth.

Fig. 572.

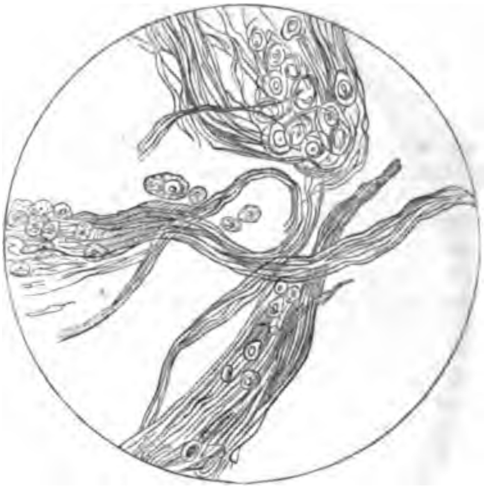


Fibrous degeneration of the testicle.

The history of the case, the chronic course of the disease, the absence of pain, the freedom from lymphatic involvement, the integrity of the spermatic cord, and the great firmness of the tumor, readily serve to establish the diagnosis between this and other affections of the testicle.

The microscopical characters of fibrous degeneration of the testicle, consequent upon tertiary syphilis, are well illustrated in fig. 573, from a drawing by Dr. Packard. The patient, from whom I removed this organ, had been laboring under orchitis for nearly three years. The disease was attended with a large fungus and a most copious, fetid discharge; the general health was much undermined, and a painful node existed upon each tibia. The testicle was considerably reduced in size, and consisted mainly of fibrous tissue, interspersed with numerous nuclei, some adherent, others free. A full account of syphilitic orchitis will be found in the first volume.

Fig. 573.



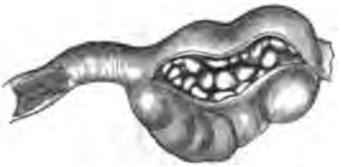
Microscopical characters of syphilitic orchitis.

When this disease is fully formed, the substance of the testicle being annihilated, the only suitable remedy is extirpation. In its earlier stages, its progress may sometimes be stayed by sorbefacient applications, aided by occasional leeching and strapping, and by gentle but persistent ptyalism.

Masses of *fibro-cartilage* are occasionally, though rarely, found in the testicle, either alone, or, as is more commonly the case, in union with other morbid products. They may be situated between the vaginal and albugineous coats, or in the tubular substance of the organ, which, when they are large or numerous, may thus be in great measure destroyed.

Ossification of the glandular structure of this organ is of very infrequent occurrence. The deposit may take place in any part of the testis, but is most common towards its centre, and is generally accompanied with considerable enlargement. It is often of an earthy rather than a bony nature, being nearly destitute of animal matter, and closely resembling the earthy substance found in the lungs and bronchial glands. Such a formation is exhibited in fig. 574, from a specimen in my possession. The organ, removed from a man, aged thirty, was greatly atrophied, and completely deprived of its natural structure.

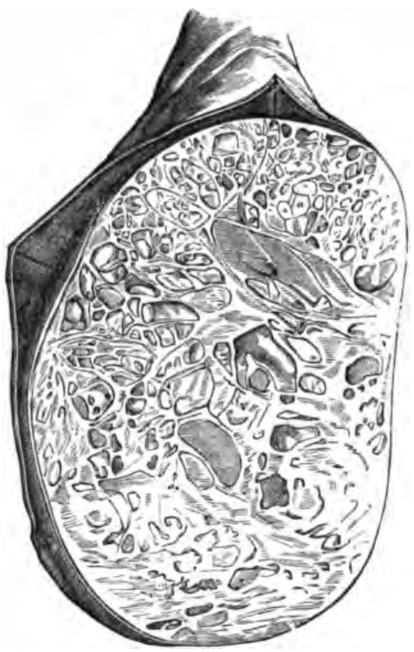
Fig. 574.



Calcareous matter in the testicle.

7. *Cystic Disease.*—The testicle, as seen in fig. 575, is sometimes the seat of serous cysts, varying in size from a mustard seed to that of a grape, a marble, or a pigeon's egg. They are extremely delicate, vascular, gregarious, and filled with a thin, watery fluid, analogous to the serum of the blood. Their number may not exceed six or eight, or there may be hundreds, if not thousands. In old cases, their coats are liable to become firm, opaque, and wrinkled, their contents being thick and glairy, like the white of egg, jelly, starch, or suet. The intermediate substance is dense, solid, and often intersected by fibrous bands. The disease which is thus formed, and which was formerly designated by the term *cystic sarcoma*, is of very slow growth, free from pain or constitutional disturbance, and most common between the twentieth and thirty-fifth year. It always begins in the body of the testis, the structure of which, together with that of the epididymis, is ultimately entirely destroyed. The tumor may acquire the bulk of a large fist, or even of a fœtal head, and is of an oval shape, opaque,

Fig. 575.



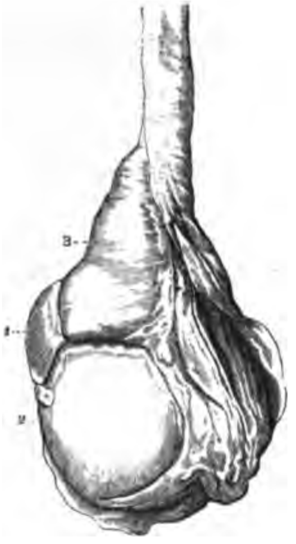
Cystic testicle.

heavy to the feel, and less fluctuating than hydrocele, with which it is liable to be confounded. The epididymis retains for a long time its natural outline. The spermatic cord and the glands of the groin are never contaminated, as in encephaloid. The veins of the scrotum are usually very conspicuous. The only remedy for this affection is excision, and it is gratifying to know that the operation, when properly performed, is never followed by relapse.

8. *Fatty Tumor.*—A fatty tumor is liable to form in the testicle, but the occurrence is very uncommon. The annexed cut, fig. 576, from Curling, exhibits a growth of this kind, removed from a man, aged forty-six. The gland was reduced to one-fifth its normal size, a considerable quantity of yellow adipose matter having been irregularly interspersed among the wasted tubules.

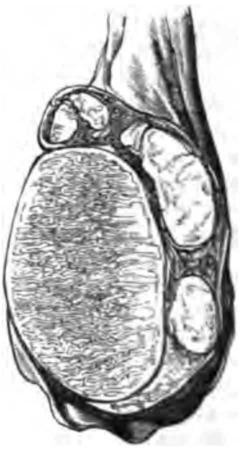
9. *Tuberculosis.*—Tuberculosis of the testis is met with chiefly in young subjects of a strumous diathesis. The adventitious deposit, which is more frequent in the epididymis than in the body of the gland, exhibits the same features as in the lungs and lymphatic ganglions It occurs in small, isolated masses, from the size of a pea to that of a bean, as in fig. 577, or in the form of infiltration, and, in time, often completely subverts the whole organ, transforming it into a yellowish, curdy, friable, cheese-like substance. It may be effused into the cellular tissue of the testis, but more commonly it is poured out into the seminiferous tubes. The gland is always indurated, more or less altered in shape, and somewhat enlarged. Sometimes the tubercular

Fig. 576.



Fatty tumor of the testicle: 1, the epididymis; 2, body of the testicle; 3, adipose substance.

Fig. 577.



Tuberculosis of the testicle.

matter is changed into a hard cretaceous substance. The disease commences insidiously, is unaccompanied by pain or tenderness on pressure, and often remains stationary for months, if not years. Ultimately, however, the skin becomes adherent, and of a livid hue, the tubercular matter softens, and the resulting abscess bursts, leaving an ill-looking ulcer, which remains fistulous for a long time, discharging a thin, serous, or gleety pus, often intermixed with semen, and particles of the morbid product.

The *treatment* of this affection is conducted on the same principles as that of tubercular disease in general. Due attention is paid to the secretions; the bowels are evacuated by mild aperients; the system is invigorated by tonics and alteratives, as quinine, iodide of iron, Lugol's solution, or bichloride of mercury; and a light, but nutritious, diet is enjoined, with regular exercise in the open air. In short, the aim should be to maintain the general health in as good a state as possible. If inflammation exist, it is to be combated by leeches, medicated lotions, and rest in the recumbent position. Matter is evacuated by free incision; fungous growth is repressed by escharotics, or removed with the scissors; and sinuses are treated by astringent injections, or laid freely open with the knife. When the disease is indolent, the part should be pencilled every day with tincture of iodine, or rubbed with some discutient ointment. Compression by means of adhesive strips, applied in the same manner as in epididymitis, often tends to promote the absorption of the adventitious matter, and to hasten the resolution of the tumor.

10. *Encephaloid.*—The most common malignant disease of the testicle is encephaloid, soft cancer, or fungus hematodes. Young persons are principally subject to it, but adults also frequently suffer, and no period of life is exempt from it. I have seen several instances of encephaloid of the testicle in which this organ was retained in the groin; and a case was recently reported by Mr. Johnson, of London, in which the malady affected a testicle that had never left the cavity of the abdomen. It has been thought, and not without reason, that a retained testicle is, relatively speaking, more liable to suffer in this wise than one in the scrotum.

Encephaloid rarely occurs on both sides. The disease, which is always rapid in its progress, begins in the body of the testis, from which it soon spreads to the epididymis, then to the cord, and finally to the lymphatic ganglions of the groin and abdomen. The tumor is of a pyriform figure, being larger below than above, and somewhat flattened in front; knobby and irregular, pulpy and elastic, heavy, opaque, and devoid of fluctuation. It may weigh several pounds, and attain the volume of a fœtal head. Sometimes the testicle remains sound, but is completely incased in medullary matter. The disease is at first unattended with pain; but, as it progresses, the suffering often becomes very great, though it is seldom as constant and severe as in scirrhus. In the latter stages of the complaint, the countenance exhibits the greenish-yellow hue so characteristic of the carcinomatous cachexia; and the tumor, red on the surface, and traversed by large subcutaneous veins, protrudes in its well-known form of a bleeding, brain-like fungus. Under the sloughing, discharge, and pain, of which the ulcer is the seat, and the consequent hectic irritation, the patient rapidly sinks. Death has been known to occur within four months from the first appearance of the disease. The prognosis is unfavorable; therapeutic measures are unavailing; and ablation, however early performed, is always speedily followed by a recurrence of the disease.

11. *Scirrhus.*—Scirrhus of the testicle always occurs late in life; it begins in the body of the gland, and is, in general, very slow in its progress. The tumor, which is hard, lobulated and misshapen, never acquires a large bulk, and is the seat of sharp, lancinating pain, accompanied by burning heat. A section of the morbid mass displays a grayish, areolar, fibrous tissue, almost destitute of vascularity, and occasionally interspersed with portions of cartilage or bone. During the progress of the disease, the spermatic cord and lymphatic ganglions of the groin become involved, the skin contracts adhesions to the subjacent parts, ulceration sets in, and the countenance assumes a characteristic sallow aspect.

The complaint, which usually arises without any assignable cause, may be distinguished from other affections by its slow progress; by the small size, great firmness, and tuberculated surface of the tumor; by the peculiar nature of the pain; by the change in the complexion; by the fact that the malady always occurs in advanced life; by the want of transparency; and by the absence of varicosity of the subcutaneous veins. It is extremely infrequent, and the only remedy for it is castration, performed before there is any lymphatic or constitutional involvement.

12. *Melanosis and Colloid.*—Melanosis and colloid of the testicle are so uncommon as not to demand any special notice. The same remark is applicable to *hydatids.* A few instances have been observed, chiefly among the inhabitants of the tropics, in which this organ contained a cyst, occupied by the *filaria medinensis*, or guinea worm.

13. *Atrophy.*—Atrophy of the testicle may be induced by a great variety of causes, as excessive venery, masturbation, external violence, wounds, mechanical pressure from tumors, effused fluids, or enlarged veins, obliteration of the spermatic artery, lesion of the cerebellum, and the inordinate use of iodine, alcohol, and narcotics. Occasionally it follows neuralgia and acute orchitis. The wasting, which is usually very gradual, is most common in young subjects, and often reduces the gland to a soft, pulpy structure, less than one-third the natural volume. The treatment is restricted, in great measure, to the removal of the exciting cause. Restoration of the normal bulk is hardly possible.

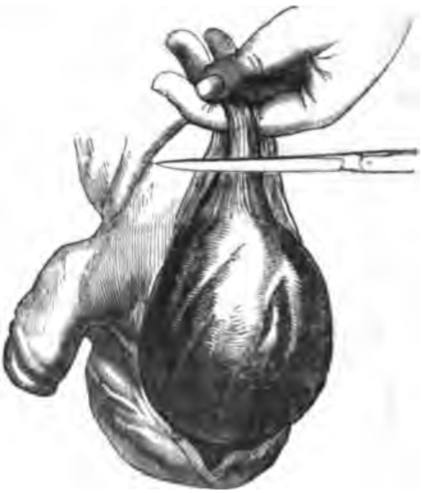
14. *Neuralgia.*—Neuralgia of the testis is chiefly observed in young subjects, of a nervous, irritable temperament, and, in general, arises without any obvious cause, though in many instances it is referred to external violence, stricture of the urethra, or disease of the prostate gland, bladder, or rectum. In most of the cases that have fallen under my notice, it was connected with dyspepsia and neuralgia of other organs. Masturbation, venereal excesses, and varicocele occasionally induce the disease. In some cases it is of a distinctly malarious origin. It is characterized by constant uneasiness, excessive morbid sensibility, and violent darting pain, which is frequently paroxysmal; it is aggravated by the slightest motion and pressure, and always extends to the neighboring parts, particularly the spermatic cord, back, and groin. Occasionally the pain is of a dull, heavy, aching nature, circumscribed, instead of diffused, and relieved rather than increased by exercise. During the height of the suffering the testicle is closely retracted, and intolerant of the slightest manipulation. In protracted cases, the general health is always materially impaired; the digestive organs are disordered; and the patient is a prey to despondency and upleasant foreboding. There is no swelling of the testicle, and, in general, no perceptible alteration in its structure. Occasionally, however, it is very much wasted, if not entirely absorbed. The cord is usually sound.

The *treatment* is similar to that of neuralgia in other parts of the body. After a preliminary course of moderate purgation, which should never be neglected, much may be expected from a combination of quinine, aconite, strychnia, and arsenic, as recommended in a former chapter. Low diet, mercury, and bloodletting generally aggravate the complaint. Stramonium is sometimes efficacious. The best local remedies are the belladonna and veratria ointment, rubbed on the scrotum and groin twice in the twenty-four hours. Temporary relief often follows the application of warm water. In some instances I have derived signal benefit from the application of a small blister to the groin, succeeded by the endermic use of sulphate of morphia. In all cases the organ must be properly suspended, and carefully protected from pressure. Castration can never be justifiable, not even when there is hopeless atrophy, inasmuch as the neuralgia would be certain to locate itself upon some other structure.

15. *Castration.*—Removal of the testicle, rendered necessary on account of different diseases, is generally a very simple operation. If the integuments are not involved, a single incision will suffice, extending from the upper to the lower part of the tumor, along its anterior surface; otherwise it must be of an elliptical form. Great care, however, must be taken not to remove too much substance,

as we shall be likely to do, if we do not make proper allowance for shrinkage. The tumor during this stage of the operation is supported with the left hand, applied to its posterior surface. The next step consists in detaching the spermatic cord from the surrounding parts, and cutting it off just above the tumor, as in fig. 578; but before this is done it is seized with a double hook, and drawn down, until its vessels are secured. A long, stout ligature being now passed through its connective tissue, but not tied, so that, in the event of secondary hemorrhage, the cord may at any moment be pulled out, the instrument is removed, and the organ rapidly detached from above downwards. In doing this, care must be taken not to wound the sound testicle, or to divide the scrotal septum. When the cord is diseased, it may be necessary to extend the dissection into the abdominal canal, and to include the whole mass in a strong thread previously to its division. In a case of incipient encephaloid of the testis upon which I operated in 1863, with the assistance of Dr. F. F. Maury, I included the entire cord, although perfectly sound, in a wire ligature left permanently in the groin. No unpleasant effects whatever followed. From three to six little arteries will generally require ligation, and it will be well not to slight any vessel of this kind, however insignificant, otherwise secondary hemorrhage will almost be inevitable. The edges of the wound should be approximated with metallic sutures, but not until the skin has become thoroughly contracted, which will seldom be under five or six hours. To prevent hemorrhage, and promote cicatrization, the parts should be well supported, and kept constantly covered with a small bladder partially filled with pounded ice. Any tendency that may occur to inversion of the edges of the wound should be counteracted by the use of adhesive strips.

Fig. 578.



Excision of the testicle.

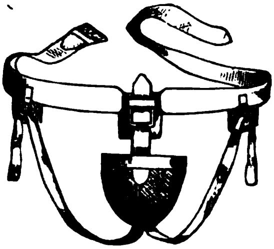
When disease of the testicle, requiring removal, is associated with scrotal hernia, the parts should be reduced previously to the operation, which should then be conducted in the usual manner, care being taken not to wound the sac.

When a testicle, the subject of malignant disease, is situated in the groin, safe removal can only be effected by the most patient and cautious dissection. Unless unusual care is taken, there will be great danger of wounding the peritoneum, if not also the bowel and omentum, especially if the affection coexists with inguinal hernia, and of thus lighting up fatal inflammation. The principal incision should be carried in the same direction as in the operation for the relief of strangulated hernia, only somewhat higher up, and free use made of the grooved director in dividing the superimposed structures. As the diagnosis is generally obscure, the first step should be of an exploratory character. The cord requires to be divided unusually high up, and the securest plan therefore is to include it, vessels and all, in a wire ligature left permanently in the parts.

Castration performed for the relief of carcinoma is invariably followed by relapse, either at the cicatrice, in the neighboring lymphatic ganglions, or in some other part of the body, the period varying from a few weeks to several months. In a case reported by Mr. Stork, the patient survived the operation fourteen months.

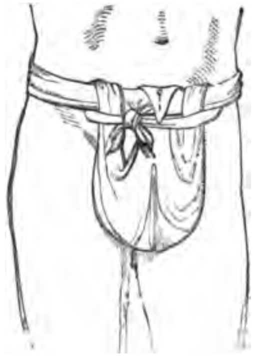
Ordinary castration is commonly a perfectly safe procedure. I have myself never met with any serious accident. The chief sources of danger are secondary hemorrhage, peritonitis, erysipelas, and pyemia. A considerable number of cases of successful self-castration have been recorded.

Fig. 579.



Gum-elastic suspensory.

Fig. 580.



Mayor's suspensory apparatus.

16. *Bandages for the Testicle.*—Various contrivances may be employed for supporting the testicle when in a state of disease, rest being of great importance in all affections of this organ, as well as in those of the vaginal tunic, the scrotum, and the spermatic cord. The article usually preferred is the ordinary gum-elastic bag, represented in fig. 579, or a bag made of knit silk, both of which have the advantage at once of softness, lightness, and efficiency. When the parts, however, suffer from acute disease, the better plan is to support them with a large, soft handkerchief, the centre, folded cornerwise, being applied to the scrotum, and the ends attached to a circular belly-band. The same object may be attained by the use of Mayor's *suspensory triangle*, exhibited in fig. 580. A band being fastened round the abdomen as in the preceding case, the base of a piece of muslin, cut in the form of a triangle, is applied to the root of the scrotum, while the tails, brought up in front, are passed round the belly-band from before backwards and tied in front into a double slip-knot. The apex of the triangle is next carried round the band in the opposite direction, and pinned to the transverse portion of the tails. In many cases, the requisite support may readily be afforded by a broad strip of muslin, the ends of which, spread with adhesive plaster, are carried obliquely upwards, over the abdomen, in the direction of the spinous processes of the iliac bones.

SECT. II.—AFFECTIONS OF THE VAGINAL TUNIC.

The principal affections of the vaginal tunic of the testicle are acute inflammation, hydrocele, hematocele, and fibrous growths, the latter of which, however, are very uncommon.

ACUTE INFLAMMATION.

Acute inflammation of this membrane is exceedingly frequent, but as it is generally associated with orchitis it is often difficult to detect its true character. The most common cause of the disease is repulsion of gonorrhœa, but it may also arise from external injury, as a blow, or wound, the application of nitrate of silver, or the injection of an irritating fluid, as iodine or port wine. A tight stricture of the urethra may likewise give rise to it.

The attack, however induced, is usually rapidly followed by an effusion of serum and lymph, the latter of which is either commingled with the former, or it adheres closely to the inner surface of the affected membrane; in the latter case it occasionally presents a honeycomb-like appearance, as is sometimes noticed in the pericardium. The quantity of serum is generally small. When the inflammation is intense, as, for example, after the injection of a hydrocele, the fluid is often of a reddish color, from the presence of hematin.

The most prominent local symptoms are, more or less swelling of the testicle, severe pain, of a tensive, aching or throbbing character, and exquisite tenderness on pressure, with a distressing sense of weight. The part feels hard, and the scrotum is of a reddish color. With a little care, distinct fluctuation may be detected, especially if the effusion is at all considerable. The patient is feverish and restless. The disease, if not speedily arrested, may terminate in suppuration.

The *treatment* must be strictly antiphlogistic. Recumbency, depletion, and abstinence from food are of paramount importance. The testicle is carefully suspended, and kept constantly wet with a strong solution of lead and opium. If the morbid action is unusually severe leeches may be applied. The excessive pain and tension are most effectually relieved by an early incision, in order to afford free vent to the pent-up fluid.

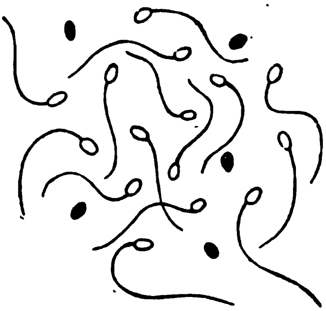
HYDROCELE.

Hydrocele is an accumulation of water in the vaginal tunic of the testicle, or in a serous cyst of the spermatic cord, between this gland and the abdominal ring. A similar affection occasionally exists in a hernial sac. It is most common in adults, but may occur at any period of life; sometimes, indeed, it is congenital, and, on the other hand, it is occasionally met with at a very advanced age. Thus, I saw a case with Dr. Jewell in a gentleman, ninety-one years old, the tumor containing twenty-four ounces of limpid fluid. The affection, which sometimes forms very rapidly, usually arises without any obvious cause, and presents itself in several varieties of form, as the simple and the encysted.

Hydrocele of the *vaginal tunic* may be single or double, although the latter is infrequent, especially in this country. It appears, however, to be sufficiently common in the East Indies; for of 1000 cases of the disease, treated at the Native Hospital of Calcutta, it was double in 370. It occurs with nearly equal frequency on both sides.

The fluid, varying in quantity from ten to twenty ounces, is generally thin and limpid, but in old cases, or when there is disease of the testicle, epididymis, or serous membrane, it is liable to be thick and of a yellowish, amber, or citron color. Sometimes it is red, brownish, or slightly greenish; and it may even be purulent, fibrinous, or intermixed with particles of cholesterine. It is free from odor, saline in its taste, and coagulable by heat, alcohol, and the dilute acids; circumstances which show its affinity with the serum of the blood from which it is derived. Several cases have been noticed in which it possessed the color and opacity of milk. Spermatozoa, fig. 581, are also occasionally found in it, but much oftener in encysted than in ordinary hydrocele.

Fig. 581.



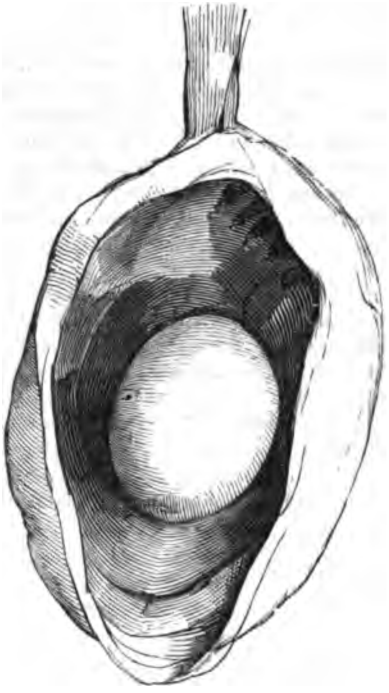
Spermatozoa in the fluid of hydrocele.

The quantity of fluid in hydrocele is subject to much diversity; in this country it rarely, on an average, exceeds sixteen or eighteen ounces. There are cases, however, in which it is much greater. Thus, Dr. Jones, physician to Franklin and Washington, has recorded an instance, in his work on surgery, of two gallons; and Professor May has communicated to me the particulars of the case of a negro, aged sixty, of seventy-two ounces, the tumor measuring nearly twelve inches in length, by twenty-three inches in circumference. Gibbon, the historian, had a hydrocele which contained a gallon and a half of fluid. In general, the largest accumulations of this kind occur in the inhabitants of tropical climates, particularly in those of the East and West Indies.

The vaginal tunic in this affection is commonly unaltered; but in old cases it is sometimes very hard, opaque, thickened, fibrous, cartilaginous, or even partially calcified. Cases have been recorded in which its inner surface was studded with fine sandy matter, evidently the result of former inflammation. The cavity of the vaginal tunic is occasionally intersected by fibrinous bands, or even divided into distinct compartments, forming a sort of multilocular tumor; and instances are observed in which it contains serous cysts, hydatids, or cartilaginous concretions. The albugineous coat is seldom changed. The same is generally the case with the testicle; but this organ is, occasionally, enlarged and preternaturally firm, and the disease is then termed *hydro-sarcocele*. Fig. 582, from a preparation in my collection, exhibits the appearances of the parts in the more common forms of that disease.

This variety of hydrocele forms as a slow, chronic swelling, with little or no pain, and no discoloration of the skin; elastic; fluctuating; smooth on the surface; movable, but unaffected by pressure and position; translucent under transmitted light; of an ovoidal or pyriform figure; gradually ascending from the lower part of the scrotum upwards; and varying in size from a small fist to that of a fœtal head. The testicle lies at the posterior part of the tumor, towards its inferior third, and the spermatic cord may generally be easily felt in its natural situation. The swelling is sometimes contracted at the middle so as to give it an hour-glass appearance, and not unfrequently it assumes an elongated pyramidal form, being larger above than below. In old cases, or where the accumulation is very considerable, amounting to fifteen or twenty ounces, it is very hard, tense, and devoid both of fluctuation and translucency. The testicle is occasionally situated in front, and in quite a number of instances I have met with it at the bottom of the tumor. Not long ago I treated a case in a youth of fourteen years, in which the organ was suspended at the top of the fluid.

Fig. 582.



Hydrocele of the vaginal tunic.

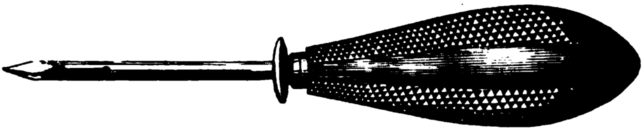
The *diagnosis* is determined by the history of the tumor, by its gradual increase from below upwards, by the absence of pain, by the sickening sensation experienced on making pressure in the situation of the testicle, by the want of impulse on coughing, and by the peculiar shape of the swelling. By darkening the room, and then holding a candle opposite the tumor, at the same time that one hand is placed in front and the other behind it, a certain degree of translucency is generally perceived. In hernia, with which this affection is most liable to be confounded, the swelling begins at the abdominal ring and gradually descends; the spermatic cord is situated at the back part, and the testicle at the bottom; there is distinct impulse on coughing; and the contents disappear on pressure, or on assuming the recumbent position. Moreover, in scrotal hernia there is generally an unusual fulness in the groin, increased on coughing, with an appearance of active motion, owing to the distension of the bowel. In hydrocele, as well as in sarcocele, the groin, especially in the milder cases, retains its natural aspect and feel, and the tumor may be thrown about more, being easily pushed upwards, downwards, or laterally; a procedure which is either very difficult, or quite impracticable, in scrotal hernia, on account of the angle formed by the protruded parts.

In sarcocele and malignant disease of the testicle, the tumor feels heavier than in hydrocele, its shape is more irregular, the surface is less smooth, there is an entire absence of transparency, and the gland is deprived of its natural sensibility. In all obscure cases, an exploring needle, carefully inserted, will reveal the true nature of the affection.

Treatment.—Hydrocele is unattended with danger, but as it incommodes by its weight and bulk, the patient is in time induced to apply for relief. The disease occasionally disappears spontaneously during the treatment of other affections; in some instances a cure is effected by the accidental rupture of the sac by external violence; and sometimes the fluid is removed by the use of blisters, tincture of iodine, spirits of camphor, pustulation with tartar emetic and lotions of hydrochlorate of ammonia. When the tumor has attained a certain bulk, nothing short of tapping is found to answer, and this operation may be performed either with a view to a palliative or a radical effect.

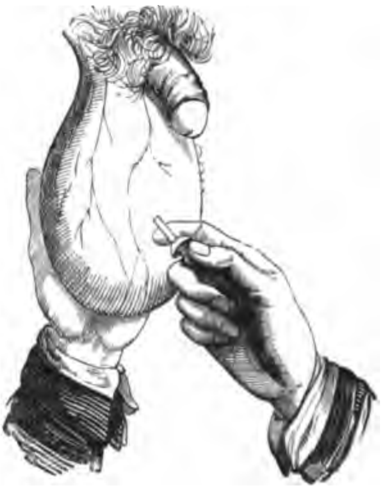
The *palliative* treatment is indicated chiefly when the patient is very old and feeble, or so timid as to be unwilling to submit to the radical operation; when the tumor is very bulky; or, lastly, when the disease is complicated with sarcocele, enlargement of the spermatic cord, scrotal hernia, or stricture of the urethra. It consists in evacuating the fluid from time to time with a lancet, bistoury, or trocar, the patient being erect, seated in a chair, or placed in the recumbent position. The tumor, rendered tense by grasping it behind with the left hand, is punctured at its anterior part, just below the middle, by inclining the instrument obliquely upwards and backwards, in order to avoid injury to the testis. If a trocar, fig. 583, be used, the perforator is now withdrawn, and the canula pushed on into the sac, where it is retained until all the serum has escaped. When the operation, which is exceedingly simple and easy of execution, is over, the wound is either left uncovered, or it is closed with a piece of adhesive plaster, and the scrotum supported with a suspensory bag. Undue excitement is avoided by observing for a few days light diet and the recumbent posture. If this precaution be neglected, acute inflammation of the vaginal tunic may arise, followed by suppuration, abscess, or sloughing. The operation usually requires to be repeated in four, six, or eight months. The annexed cut, fig. 584, exhibits the manner of grasping and perforating the tumor.

Fig. 583.



Trocar.

Fig. 584.



Operation of tapping a hydrocele, the trocar entering the tumor.

The vaginal tunic may also be emptied by *acupuncture*, performed with a cataract needle, introduced at four or five different points of the tumor. A slight oozing, or a thin, thread-like stream occasionally follows the withdrawal of the instrument; but, in general, the serum, instead of escaping externally, gradually infiltrates the cellular tissue of the scrotum, whence it is removed in two or three days by absorption. Acupuncture is applicable chiefly to recent cases of hydrocele, and is followed less quickly by reaccumulation than after the fluid has been evacuated by the trocar or knife.

For the *radical* cure of hydrocele, the principal operations are incision, excision, cauterization, the seton, and injection. Of these, the first three are nearly obsolete, and will, therefore, require but little notice. Incision, the most ancient method of all, consists in laying the sac freely open with a knife, and dressing the wound simply with lint, or some irritating substance. Acute inflammation soon succeeds, followed by suppuration, and the part finally heals by the granulating process. Incision is objectionable in common cases, but may be advantageously resorted to when the tumor is multilocular, or when it contains cysts, hydatids, or cartilaginous concretions. Excision, which is also of considerable antiquity, was revived, in 1755, by Douglas, of England, and is performed by cutting away a portion of the serous sac with a pair of scissors, the cord and testis being left untouched. The after-treatment is the same as in incision. A modification of this operation, proposed by Mr. Kinder Wood, consists, in opening the tumor with a broad-shouldered lancet, and snipping off a small piece of the vaginal tunic, previously hooked up with a tenaculum. The puncture is closed with adhesive plaster. The operation, however, rarely succeeds. The treatment by caustic was much employed during the last century, but is now entirely exploded. The caustic was applied in the same manner as for making an issue; the slough extended to the serous membrane, which, after evacuation of the fluid, gradually contracted like an ordinary abscess, and was ultimately obliterated by adhesion or granulation.

The use of the *seton* for the radical cure of hydrocele originated with the Arabians, and was much in vogue in the fourteenth century. Pott strongly recommended it, and has given a minute description of the mode of introducing it. The operation, which I prefer to every other, both on account of its simplicity, its freedom from danger, and its never-failing certainty, is performed in the same manner as in the method by injection, except that the puncture is made a little lower down. After all the water has escaped, the canula is pushed on towards the superior part of the scrotum, where a counter-aperture is made by the reintroduction of the perforator. The instrument being withdrawn, a piece of braid, or narrow strip of muslin, is passed through the canula by means of an eyed probe. The operation is finished by removing the canula, and tying the ends of the seton loosely in front of the scrotum. Sometimes a few threads, or a piece of thin twine, introduced with a curved needle, will answer the purpose. Whatever substance be selected, my plan is to let it remain from twenty-four to forty-eight hours, or until the scrotum is quite hard, and at least one-fourth as large as before the operation. The part should, meanwhile, be properly suspended, and the patient kept on his back. For the first few days after the removal of the seton, fomentations of acetate of lead and opium are the most eligible; and these may be gradually, but cautiously, succeeded by spirituous lotions, dilute tincture of iodine, or mercurial ointment. The cure is usually completed within a fortnight. I have performed this operation many times, and have never known it to be productive of any ill effects.

The treatment by *injection* is alluded to by Celsus, but the credit of introducing it into general practice is due to Sir James Earle, who published a treatise on it in 1791. The apparatus required for the operation is a rounded trocar and canula, and a brass syringe, or gum-elastic bag, furnished with a nozzle and stopcock. Almost any kind of fluid may be used, as lime-water, milk, simple water, dilute alcohol, wine, spirits of camphor, and solutions of alum, zinc, nitre, chloride of sodium, tannin, nitrate of silver, or corrosive sublimate. Earle was in the habit of employing port wine and water, in the proportion of two-thirds of the former to one-third of the latter. At present, the favorite injection is tincture of iodine, either pure or diluted with three parts of water.

In performing the operation, the patient sits, stands, or lies, as may be most convenient, the hydrocele being punctured in the same manner as in the palliative method. After the water, however, has been evacuated, the canula is pushed in as far as possible, and the vaginal tunic carefully nipped around it with the thumb and forefinger. The tube of the syringe is then applied to the orifice of the canula, and the stimulating liquid is gradually injected, until the sac is slightly distended. It is rarely necessary to throw in more than two or three ounces, especially if the fluid is brought in contact with every part of the surface of the serous sac, as it readily may be by compressing the scrotum with the hand. In general, the injection is retained from two to five minutes, or until the patient complains of a slight sickening sensation, and of pain in the part and in the spermatic cord, when the liquid is squeezed out, and the canula withdrawn.

The wound may be let alone, or be closed with a strip of adhesive plaster. When the pure tincture of iodine is used, from two to three drachms are injected, and permitted to remain permanently in the sac, from which it disappears by absorption. Usually, however, it is best to throw in several ounces of a weak solution, and to remove it as soon as it causes pain or other inconvenience. When the tumor is very large, instead of injecting it at once, it should be tapped with a trocar, and the radical treatment deferred until the fluid has reaccumulated in smaller quantity. In case the hydrocele is double, it would be improper to operate upon both sides at the same time.

The treatment, after injection, is strictly antiphlogistic; the part is carefully watched, and undue action promptly met by warm saturnine fomentations, purgatives, and nauseants. If the inflammation is likely to prove insufficient, the scrotum may be kneaded with the hand, or the patient may walk about the apartment. Should the operation fail, it may be repeated as soon as there is a moderate reaccumulation of fluid. When the injection escapes into the cellular substance, the scrotum must be freely incised, and, after the fluid is pressed out, it is covered with warm fomentations.

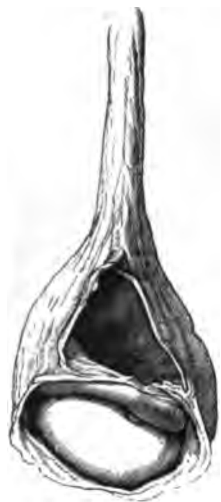
The chief objections to this method of treatment are, first, its liability to occasional failure; secondly, the escape of the injection into the cellular tissue of the scrotum; thirdly, the difficulty of regulating the amount of inflammation; and, fourthly, the occurrence of extensive suppuration, abscess, and even sloughing. In a case which I witnessed in a young, robust mechanic, a patient of Dr. McIlwain, the injection, consisting of port wine and water, was followed by tetanus and death. The vaginal tunic was considerably thickened, and contained several ounces of sero-sanguinolent fluid, intermixed with pus and lymph; but no adhesions had taken place between the opposite sides. The patient was twenty-six years of age, and the disease made its appearance on the eighth day after the operation.

During the last four years, I have effected a number of rapid and excellent cures of hydrocele, both in adults and children, by laying open the vaginal tunic with a small incision, and, after all the fluid had been discharged, *mopping* the sac freely with equal parts of tincture of iodine and alcohol, or iodine variously diluted. In no instance have any unpleasant symptoms followed this procedure.

It has been proposed, within the last fifteen years, to treat hydrocele by *electro-puncture*. The operation, which originated with Dr. Pechioli, of Italy, is performed by introducing at different points of the tumor two slender acupuncture needles, four inches in length, and connecting one to the positive and the other to the negative pole of a Daniel's constant battery. The action may be maintained from five to forty minutes. The process, which is not free from pain, is best adapted to recent cases, and is occasionally promptly followed by a cure. In general, however, it requires to be several times repeated at intervals of two or three days.

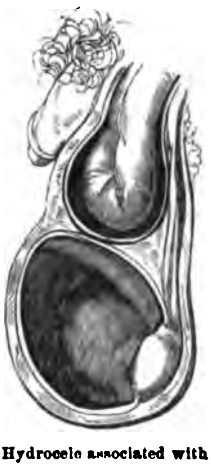
In *congenital hydrocele*, the original communication between the peritoneum and vaginal tunic continues open instead of being obliterated, as it is in the ordinary form of the complaint; and, hence, the fluid passes readily from one of these cavities into the other, as the bowel does in congenital hernia. The intervening canal is seldom larger than a goose-quill. The tumor, which is smooth, transparent, and fluctuating, and which usually appears soon after birth, is prolonged into the groin, and receives an impulse on coughing; it is larger in the erect than in the recumbent posture, and by gentle pressure its contents may be gradually forced into the abdomen, the testicle remaining in the scrotum. The indication is, first, to obliterate the neck of the sac, so as to cut off the communication with the peritoneal cavity; and, secondly, to encourage the removal of the fluid by absorption. This may usually be fulfilled by the constant pressure of a spring-truss, and the use of discutient lotions, iodine, or acupuncture. In adults, or in obstinate cases, the ordinary treatment may be required. The seton and injection, before closure of the intervening canal, are liable to be followed by inflammation, which, extending to the peritoneum, might endanger life.

Fig. 585.



Encysted hydrocele.

Fig. 586.



Hydrocele associated with hernia.

A hydrocele of the testis may be *encysted*, as in fig. 585, the water being contained in an adventitious sac, distinct from the vaginal tunic, and composed of a thin, delicate serous membrane. The tumor is small, perhaps not larger than a common marble, tense and elastic, with little or no fluctuation and transparency, and filled with a limpid, colorless, almost uncoagulable fluid. The testicle is in front or at the side, seldom at the back, as in simple hydrocele; and the disease is commonly developed beneath the serous investment of the epididymis, though it may arise also between the vaginal and albugineous coats of the gland. When the tumor consists of two cysts, it has sometimes a lobulated appearance. The affection seldom requires interference; should it do so, it may readily be removed by a seton, consisting of a single cord of saddler's silk.

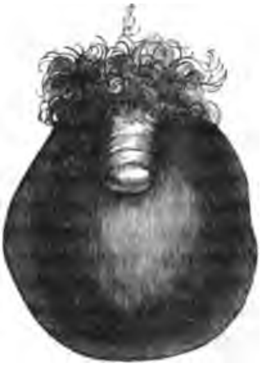
Hydrocele occurs in *children*. The tumor is remarkably translucent, soft, fluctuating, and seldom larger than a hen's egg. The water often disappears spontaneously; and, when treatment is required, the means are always much milder than in hydrocele of the adult. A cure may frequently be effected in a few days by pencilling the scrotum with iodine, or by the use of some discutient lotion, as hydrochlorate of ammonia, alum, acetate of lead, or a combination of equal parts of alcohol and camphorated spirits with the addition of a small quantity of Goulard's extract. In two cases, I have succeeded perfectly, by letting out the water with a lancet, and then strapping the part with adhesive plaster, as in orchitis. When these means fail, acupuncture may be resorted to; or the tumor may be traversed with a delicate thread, wet with tincture of iodine, and retained from twelve to twenty-four hours; not longer, lest undue inflammation should ensue.

Hernial Hydrocele.—The sac of an old scrotal hernia, after the obliteration of its neck, sometimes becomes dropsical, constituting what is termed *oscheo-hydrocele*. The tumor is of considerable bulk, pyramidal, fluctuating, translucent, and occupied by a viscid, amber-colored fluid. The diagnosis is easy, and the treatment is the same as in ordinary hydrocele. Occasionally, the two diseases coexist, as is shown in the adjoining sketch, fig 586, where the sac of an inguinal hernia is situated immediately above a small hydrocele of the vaginal tunic.

HEMATOCELE.

By a hematocele, exhibited in fig. 587, is understood a collection of blood in the vaginal tunic of the testicle. The swelling is either globular or pyramidal, being larger below than above, opaque, tense, heavy, and nearly free from fluctuation. The blood, varying in quantity from a few ounces to half a gallon, is of a dark-brown color; or, if some time has elapsed, of the color of coffee grounds, partly fluid and partly coagulated. In old cases, it is occasionally lamelliform and organized, as in an aneurismal sac. The vaginal tunic may be natural, opaque and wrinkled, thickened and indurated, or soft and pulpy. The testis is generally sound. The hemorrhage may be caused by the spontaneous rupture of a vessel; but usually it is referable to a wound, bruise, or blow. The disease may occur alone, or in union with hydrocele, when it is commonly produced by tapping. In a case of hematocele described by Bochard, in a man, aged fifty-one, the tumor extended into the abdomen, and was lost in the bottom of the left iliac fossa.

Fig. 587.



Hematocele of the vaginal tunic of the testicle.

Hematocele is distinguished from other affections by its sudden development, its solid feel, the absence of translucency, its dark color, its obscure fluctuation, and the fact that it is almost always occasioned by external injury.

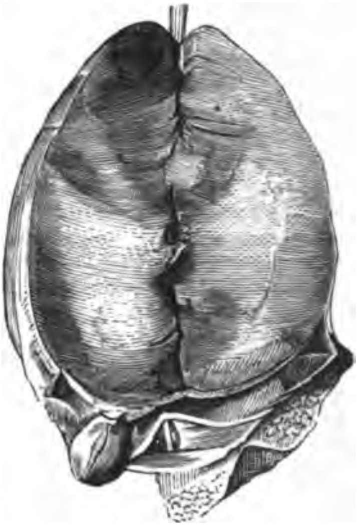
The indication is to prevent inflammation, and to encourage the removal of the effused blood by sorbefacients. If these means fail, and the blood acts as a foreign substance, causing pain, swelling, and suppuration, a free incision is made along the centre of the tumor, and the wound healed by the granulating process. When there is much thickening of the vaginal tunic, it may be necessary to cut away a portion of the diseased membrane. If the extravasation coexists with hydrocele, the tumor is evacuated with a lancet, and immediately after traversed with a seton.

FIBROUS TUMORS.

Fibrous tumors occasionally grow within the vaginal tunic, the testis retaining its integrity. Some years ago, I operated upon a colored man, aged twenty-five, removing from the left side a fibrous mass weighing nearly five pounds. It was of an ovoidal form, larger below than above, and was eight inches and a quarter in length by thirteen in circumference at its widest part. Its surface was perfectly smooth, and adherent, in the greater portion of its extent, to the vaginal tunic, by loose cellular substance. The testicle was situated at the lower extremity of the tumor, and, with the exception of being slightly flattened, had undergone no appreciable alteration. The deferent duct, also perfectly sound, ran along the posterior surface of the tumor.

A section of the mass exhibited a smooth, uniform surface, of a pale, grayish color. It was slightly elastic, almost incompressible, and remarkably solid, offering great resistance to the knife. A thin slice of it was opaque, and nearly as tough as sole leather. No free cellular tissue could be detected. The tumor had been growing for upwards of five years—during the last eighteen months very rapidly—but caused no other inconvenience than what resulted from its weight and bulk. The spermatic cord, the skin of the scrotum, and the ganglions of the groin were perfectly healthy. The patient recovered from the operation, but died some months afterwards of pulmonary phthisis. Fig. 588 exhibits the form and structure of the tumor; the testicle is seen at the base, to the left of the middle line.

Fig. 588.



Fibrous tumor of the vaginal tunic.

SECT. III.—AFFECTIONS OF THE SCROTUM.

The scrotum is liable to wounds, inflammation, different kinds of eruptions, hypertrophy, tumors, varix, and carcinoma.

1 *Wounds* of the scrotum are not often met with; they may be of various kinds, and require to be treated as similar lesions in other parts of the body. If the edges are properly approximated, wounds of the scrotum generally heal with astonishing rapidity, even when the integuments are involved to a great extent, or when both testicles are completely denuded. Considerable hemorrhage often attends, demanding the free use of the ligature. The parts should be well supported during the cicatrization.

Gunshot wounds of the scrotum, of which I have seen numerous cases, generally readily heal under simple water-dressing. When complicated with injury of the urethra and an escape of urine, they are liable to be followed by extensive sloughing, necessitating free incision. Such an effect is best prevented by the timely use of the catheter.

2. *Hematocele* of the scrotum is usually caused by a strain, blow, or kick, producing a rupture of some of the vessels of the part, the contents of which are extravasated into the areolar tissue below the skin. Blood is also, at the same time, frequently effused into the spermatic cord and the vaginal tunic of the testicle. The scrotum is of a dark, livid color, feels unusually heavy and doughy, and suddenly increases very greatly in bulk. The affection is similar to extravasations of blood in other regions, and requires similar treatment.

3. *Inflammation* of the scrotum may present itself in various forms, as the simple, traumatic, and erysipelatous, of which the latter is the only one requiring even a passing notice. It may exist by itself, or in union with the same disease in other parts of the body, and requires particular attention on account of its liability to terminate in sloughing. Elderly persons, of dilapidated constitution and intemperate habits, are its most frequent subjects. The disease is characterized by extensive swelling, from the infiltration of sero-plastic matter; the parts feel doughy and inelastic, readily pitting on pressure; the pain is of a smarting, burning nature; and the surface is of a pale-reddish, glossy appearance. More or less constitutional disturbance is present, the symptoms not unfrequently assuming a typhoid type. Extensive sloughing may occur, exposing the testes merely suspended by their cords.

The *treatment* consists in attention to the general health by means of tonics, stimulants, and alterants, and in the application of tincture of iodine, with saturnine and anodyne fomentations, the parts being suspended in the usual manner. Tension is relieved, and matter evacuated, by suitable incisions.

4. A peculiar *sloughing* disease occasionally occurs in the scrotum of young children. In a case which I saw many years ago in an infant two weeks old, an eschar, about an inch in diameter, suddenly formed over the right testicle, leaving the vaginal tunic perfectly denuded, and producing an angry-looking sore, with hard, glossy edges, reposing upon black-colored cellular tissue. The spermatic cord was indurated, tumid, and remarkably tender on pressure. The constitution did not seem to suffer much. In the course of twenty-four hours after these symptoms were discovered, the vaginal sac became distended; and, on puncturing it, a considerable quantity of sero-purulent fluid, of a yellowish color, followed the lancet. A small portion of the membrane now sloughed, leaving the gland quite bare. By touching the part with nitrate of silver, and applying a yeast poultice, granulations gradually sprouted up, and the infant got well.

5. *Psoriasis* sometimes forms on the scrotum, the skin of which becomes cracked or fissured, red, inflamed, thickened, and affected with the most intolerable itching. The disease, which is often associated with psoriasis of the perineum, anus, groin, and inside of the thighs, is produced by various causes, both local and constitutional, and is mostly met with in middle-aged and elderly subjects, of a delicate skin, and light complexion. It is frequently very intractable, and then always constitutes a source of excessive suffering.

In the *treatment* of this affection, diligent search must be made for the exciting cause, the removal of which alone often promptly arrests the morbid action. In general, it will be found to be intimately connected with disorder of the constitution, or derangement of the digestive organs, thus pointing to the necessity of a properly regulated diet, the employment of purgatives, and the exhibition of alterants, as blue mass and ipecacuanha, along with the antimonial and saline mixture. Iodide of potassium and sarsaparilla are of no use. The best local remedies are weak solutions of iodine, acetate of lead, and bichloride of mercury. In my own practice, however, I have found no application so soothing and effectual as the dilute ointment of the nitrate of mercury, in the proportion of ten grains to the drachm of simple cerate.

6. *Hypertrophy* of the scrotum, sometimes existing as a congenital defect, is usually the result of long-continued distension and pressure consequent upon hernia, hydrocele, varicocele, and other tumors. It presents itself in varying degrees, from slight increase of the parts to the development of a tumor of large bulk and firm consistence. The treatment is palliative and radical; the former consisting in steady, systematic suspension, the latter, in careful retrenchment.

7. The *sebaceous tumor* is occasionally met with in this situation, just beneath the skin, which is generally so thin and transparent as to allow the contents of the growth to be distinctly visible. It sometimes occurs in considerable numbers. In one case, of a young man, of twenty-four, recently under my care, upwards of one hundred existed, from the volume of a millet seed up to that of a pea. Interference is unnecessary, unless the tumors are so large as to incommodate by their bulk and weight, which, however, is seldom the case.

8. The *cystic tumor* of the scrotum is very rare. It is composed, as the name implies, of cysts, filled with serous fluid, and interspersed with fibroid substance, its original seat being apparently in the subcutaneous areolar tissue. The number of cysts is variable, from twenty to thirty having been found in a single tumor, new ones being, doubtless, from time to time added to the old. Their volume ranges from that of a millet-seed to that of a pea; they are of a spherical or globular shape, and, as they increase in size and number, as they always do very slowly, they encroach upon the scrotum, imparting to it a rough, nodulated appearance, which, together with a faint sense of fluctuation, and a certain degree of elasticity, affords the only evidence of their existence. The proper remedy is excision. An excellent illustration of the character and

Fig. 589.

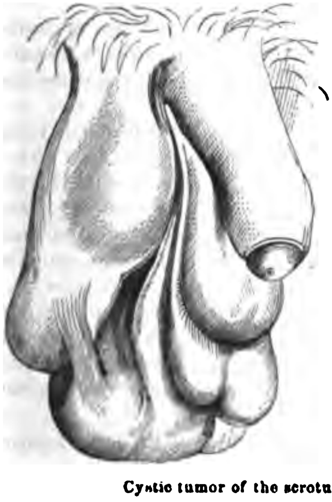
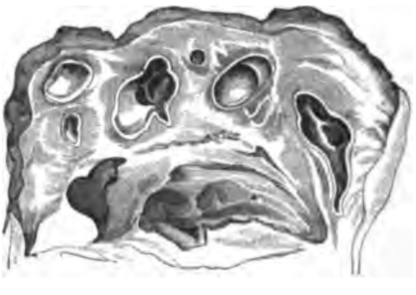


Fig. 590.



Cystic tumor of the scrotum, exhibiting its external and internal characters.

structure of this variety of morbid growth is furnished in figs.
Curling.

9. The *fatty tumor* of the scrotum, also extremely rare,
itself as a small nodule in the connective tissue, imparting, whi
idea of the existence of a third testicle. It is of a doughy, ine
seldom attains much bulk, although in a case operated upon by
Kimball, of Lowell, a growth of this kind, consisting of numero
of pure fat, weighed two pounds. The diagnosis is usually very
this is so much the less to be regretted as the only remedy is
In the case just referred to, the parts presented the characteris
scrotal hernia.

10. A *fibro-cartilaginous* tumor is sometimes developed in the
ginning probably in the cellular texture, and thence gradually exte
skin and deeper structures. It is distinguished by its extraordinar
and tardy growth, the absence of pain and lymphatic involvement
integrity of the general health. In a tumor of this kind, whose
been reported by Dr. John G. Kerr, of Canton, large quantities of
were deposited, exhibiting all the microscopic characteristics of the
tissue. The mass weighed five pounds after excision. The patient,
a good recovery, was twenty-eight years old.

11. *Earthy concretions*, from the volume of a pea to that of an
and then form in the scrotum, their number being sometimes quite
Of a dull whitish, or grayish color, they are of a cretaceous consisten
composed mainly of carbonate and phosphate of lime, cemented toge
small quantity of animal matter. They are of tardy formation, and
exclusively in middle-aged and elderly subjects, in connection with hyp
of the scrotum. The proper remedy is excision.

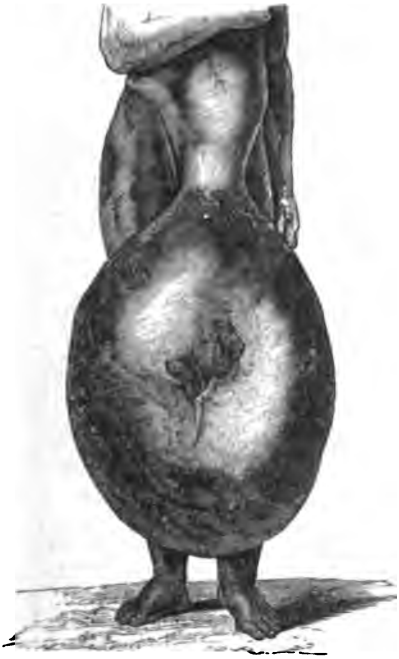
12. The scrotum sometimes contains cysts communicating with the
and filled with *calculi*. The composition of the latter is variable,
eral, they consist of uric acid; they are usually quite smooth, ovoidal
in their shape, and from the size of a millet-seed up to that of a
Their number is sometimes remarkable, nearly as many as one hundred
been found in a single cyst. The cyst itself is commonly very thick,
rough, especially in old cases. The only available treatment is excision.

13. The scrotum is liable to be transformed into a hard, fibrous mass,
tuting what is termed *elephantiasis* or *sarcomatous* enlargement. The
magnitude which this disease may attain is almost incredible. Titley
from the scrotum of a negro a tumor of this kind, which weighed seventy
and extended nearly down to the feet, as seen in fig. 591. Baron La
detailed the particulars of one which was supposed to weigh one hund
twenty pounds. In the medical museum at Montpellier is a diseased
this character, which was preserved by Delpech, the weight of which
hundred and sixty pounds. In my private collection is a specimen of el
asis, presented to me by Dr. Bozeman, of New Orleans, of forty pounds
mass began to appear early in life, and grew until the patient, a colo
was twenty years old, when it was excised by that distinguished surgeon
adjoining cut, fig. 592, exhibits an excellent view of this tumor.

The disease is seldom observed in this country or in Europe; but i
parts of Asia, Africa, South America, and the West Indies, its occur
not infrequent. Externally, the morbid growth is rough and fissured,
surface, particularly in old cases, is covered with yellowish, scaly cru
detachment of which leaves many small, herpetic sores, emitting a thin,
discharge. The skin is very thick and indurated; the cellular tissue
and scirrhous, from the distension of its cavities with semi-concrete albu
matter; the bloodvessels of the part are remarkably large and varico
the swelling is indolent, incommoding rather by its weight and bulk tha
pain. In its shape it is mostly pyriform, but sometimes ovoidal, or gl
The testicle is not necessarily implicated in the disease, nor is the sper
cord so much indurated and enlarged as in some of the other disorders

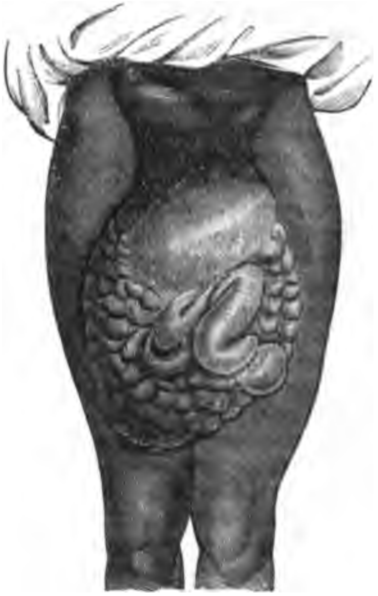
genital apparatus. The morbid mass occasionally ulcerates; and a case has been related by Hendy in which it was invaded by mortification, causing the death of the patient. The disease is often complicated with hydrocele, and occasionally with scrotal hernia.

Fig. 591.



Titley's case of elephantiasis of the scrotum.

Fig. 592.



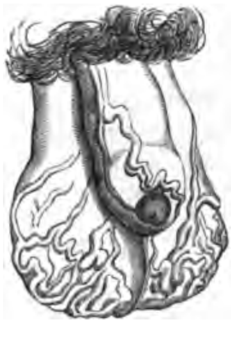
Hypertrophy or elephantiasis of the scrotum.

In the early stage of this disease relief may be attempted, though even then with hardly any prospect of success, by means of sorbefacients and systematic compression, steadily pursued for many months together. When the growth has acquired a large bulk the only remedy is excision, performed with special reference to the avoidance of hemorrhage and shock, which have nearly always proved fatal when the tumor has been of extraordinary size. If I had to deal with such a case, I should be tempted to cut away the mass piecemeal at several sittings, tying the vessels as they are divided, and using the actual cautery to sear, if necessary, the raw surface. Or, instead of this, removal might be effected partly by the knife, and partly by the écraseur. Or, perhaps, the best plan of all would be that suggested, and so happily practised, by Dr. O'Farrell, of Dublin, of elevating the tumor and pressing out its venous blood immediately prior to the excision. In an operation performed by this distinguished surgeon in 1842, an enormous mass of this kind was successfully removed in eight minutes, with the loss of only five ounces of blood, and the preservation of the genital organs. Liston and Key, in a similar case, each lost his patient upon the table; Dr. Bozeman's died nearly a fortnight after the operation, from the effects of peritonitis caused by an extension of the inflammation along the spermatic cord. Both testes were included in the excision, and the man lost twenty ounces of blood. One of the most successful operations of this kind upon record, was performed in 1837, by Dr. Picton, of New Orleans. The disease had existed for ten years, and the tumor weighed fifty-three pounds.

No *statistics* of this operation are before the profession. Dr. Esdaile, of Calcutta, declares that he has performed it upwards of one hundred and sixty times, with a mortality of only five per cent., and in no instance, he adds, was death directly due to the operation. The testicles and penis may always be saved when the weight of the tumor does not exceed fifty pounds.

14. The scrotum has been known to contain cysts filled with various kinds of *fœtal remains*, as pieces of bone, teeth, hair, and soft matter. Remarkable cases of this description, all examples of monstrosity by inclusion, have been reported, among others, by Dietrich, Eke, André, Velpeau, and Verneuil. The tumor varies in size from that of an egg to that of the fist, and is always easily recognized by its history, its stationary, or nearly stationary, character, and the irregularity of its consistence, some parts being hard, and others comparatively soft. Generally, the surgeon has no difficulty in tracing the outlines of some of the bones. Excision constitutes the proper treatment. The testicle may sometimes be saved, but in most cases it is so intimately involved in the tumor as to require to be sacrificed.

Fig. 593.

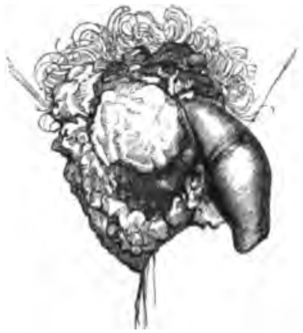


Varix of the scrotum and penis.

15. *Varix* of the scrotum is uncommon, and is observed chiefly in old bulky hydroceles and ruptures. In the case from which fig. 593 was taken, the affection was conjoined with varix of the legs, abdomen, and penis. The enlargement, although enormous, created no particular inconvenience. The patient was a common laborer, aged fifty, otherwise in good health. Should the disease become a source of suffering, relief should be sought in suspension and astringent lotions; or, if need be, in subcutaneous ligation.

16. *Carcinoma* of the scrotum is generally of the epithelial kind, and seldom occurs before puberty, its favorite period of attack being from the thirtieth to the fortieth year. It is most common in chimney-sweeps; hence it has by some been named the chimney-sweeper's cancer, seen in fig. 594. The affection ordinarily begins at the base of the scrotum, in the form of a small, wart-like excrescence, covered by a thin, scaly crust. After this has continued for a time, the hardened cuticle sloughs, leaving a superficial, painful, ill-looking ulcer, with indurated and everted edges. The surface of the sore has a red, excoriated aspect, and discharges a thin, sanguinolent fluid, often highly irritating and offensive. In this way the morbid process gradually extends, until at length a large surface of the scrotum, together with the vaginal tunic, and the exterior of the testicle, is involved in the disease. In this advanced stage, the cellular tissue around the sore is generally white and scirrhous; and the inguinal ganglions on one or both sides are enlarged, injected, and, in some instances, filled with cancerous matter.

Fig. 594.



An aggravated example of chimney-sweeper's cancer, with much destruction of the superficial textures.

The progress of carcinoma of the scrotum is generally comparatively slow; there is less local and constitutional suffering than in cancer of other parts of the body, and death seldom occurs under four or five years. A case has been reported of a chimney-sweep who lived upwards of forty years with a disease of this kind. The diagnosis of carcinoma of the scrotum is sufficiently easy, the peculiar appearance, situation, and feel of the tumor, and the history of the case, always serving to distinguish it from other affections. The only remedy is early and free excision, before there is any lymphatic involvement.

17. *Encephaloid* and *melanosis* of the scrotum are very uncommon, especially as primary diseases. They may begin either in the skin, or, as is more commonly

the case, in the subcutaneous areolar substance, from which, as they increase, they gradually extend to the other structures. I have seen quite a number of examples of melanosis, but in none did the malady involve the scrotum. Curling mentions a case in which he removed a tumor of this kind, evidently of primary formation, from the scrotum of a man, aged thirty-two. It was of a dark color, and about the size of a small walnut, with a narrow pedicle. The disease returned soon after the operation, in the vicinity of the cicatrice, and, gradually invading the inguinal and lumbar lymphatic ganglions, carried off the patient, though not until after the lapse of six years.

SECT. IV.—AFFECTIONS OF THE SPERMATIC CORD.

The spermatic cord is liable to injury, inflammation, abscess, hydrocele, accumulations of blood, and various kinds of tumors. In absence of the testicle, the cord is generally very small, and the deferent tube terminates in a rounded cul-de-sac in the groin.

1. *Wounds and Contusions.*—Wounds and contusions of the spermatic cord generally coexist with similar lesions in the neighboring parts. When severe, they may be followed by wasting of the testicle, especially when they involve the deferent tube. Copious hemorrhage may attend the division of the cord, and should always be promptly checked with the ligature, the opening being, if need be, carefully enlarged to afford the required access.

2. *Inflammation and Abscess.*—Inflammation of these structures rarely exists as an independent affection; in general, it is caused by an extension of disease from the testicle, as in gonorrhœa or syphilitic orchitis. It is characterized by great hardness, pain and tenderness of the cord, accompanied by a sense of weight, and more or less constitutional disturbance, and is to be treated upon general antiphlogistic principles. The disease occasionally passes into abscess, but such an occurrence is very uncommon, and requires no particular notice.

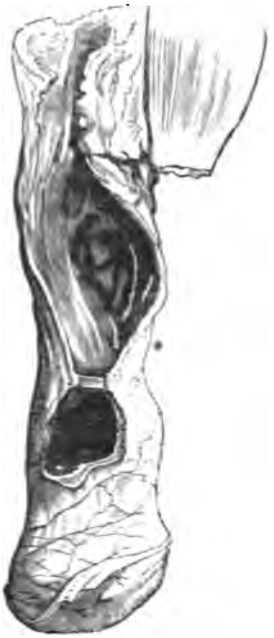
3. *Hydrocele.*—Hydrocele of the spermatic cord occurs under two varieties of form, the encysted and the diffused, the first being by far the more common of the two.

In the *encysted hydrocele*, fig. 595, the tumor is distinctly circumscribed, of an oval figure, from the size of a small marble to that of a hen's egg, and filled with a limpid or pale straw-colored fluid. Fluctuation and translucency, never well-marked, may be entirely absent. The swelling, which is movable, free from pain, and distinct from the testicle, receives no impulse in coughing, and cannot be emptied by pressure; circumstances which clearly distinguish it from hernia and hydrocele of the vaginal tunic. It may be situated at the upper part of the scrotum, just below the external ring, or even in the inguinal canal. The cyst of which it is composed, and which is, sometimes, very dense, thick, opaque, or even of a fibrous, cartilaginous, or calcified texture, is generally single, and originates, either adventitiously, or, as is more probable, in an imperfect obliteration of the tubular prolongation of the peritoneum, lying under cover of the common integuments, superficial fascia, and fibres of the cremaster muscle. The affection, although it occurs at all periods of life, is most common in infants. It may vanish spontaneously, and should never be interfered with as long as it does not cause any serious inconvenience. In all cases demanding treatment, fair trial should be given to mild means; if these fail, as they generally do in adults, the best remedy is a delicate seton, introduced with a small curved needle, and retained until the part is slightly inflamed. The operation, however, is not devoid of risk, and should, therefore, be performed with great care. In a case mentioned by Curling, severe inflammation extended along the cord into the pelvis, causing suppuration in the iliac fossa, and, for a time, seriously endangering the patient's life. Pott relates a case treated by incision that proved fatal on the seventh day, from the effects of inflammation.

A very rare form of *congenital hydrocele* of the cord is sometimes observed, the sac communicating directly with the peritoneal cavity, but not extending far, if at all, beyond the external abdominal ring. The affection is liable to be

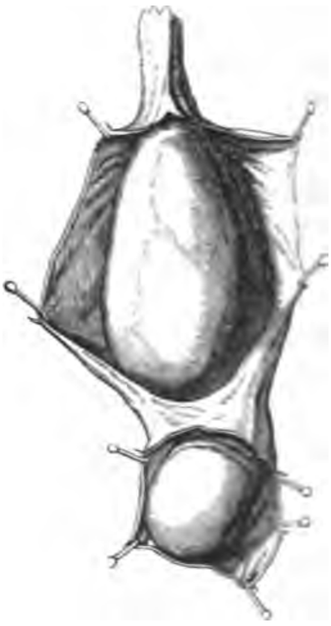
confounded with inguinal hernia, with which, in fact, it occasionally
Nannoni relates the particulars of a case, in which, supposing the
of the latter character, he tied the sac, and killed the patient, a child
of age.

Fig. 595.



Encysted hydrocele of the cord.

Fig. 596.



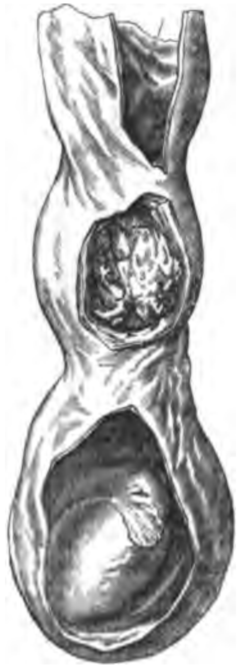
Diffused hydrocele of the cord.

In *diffused hydrocele*, fig. 596, the fluid accumulates in the cellular
the cord, the meshes of which, scarcely perceptible in the natural state, ar
verted into cells, from the size of a pea to that of a hazel-nut. Gradually
of these cells give way, from the pressure of their contents, and thus one or
large cavities are formed, which are always most distinct at the base
swelling. The hydrocele, at its commencement, is of a cylindrical shape;
at a latter period, it becomes pyramidal when the patient stands, and obl
nearly of equal dimensions throughout, when he is recumbent. It is incl
a cellular sheath, which is covered by the cremaster muscle, and extends
the testicle, which is below, to the external ring, into the inguinal canal
occasionally even into the abdominal cavity. A tumor of this description
uniform surface and definite shape, is slow in its formation, is not attended
any considerable pain, and is separated from the vaginal tunic by a distinct se
It is liable to be confounded with omental hernia, but is distinguished from
not receiving an impulse in coughing, by its imperfect removal under pr
by the fluctuation at its lower part, and by the change of figure which it u
goes in the recumbent position. Acupuncture will sometimes effect a cure
cially if aided by pressure with a compress and roller; but a small seton
safer and surer remedy. Free incision, as practised by Pott, is not to be th
of. As long as the tumor is small, and produces no pain or inconvenience
ference is unnecessary.

4. *Hematocele*.—Hematocele of the spermatic cord, fig. 597, is uncom
and is nearly always associated with, or consequent upon, encysted hydr
The tumor is hard, small, semi-fluctuating and filled with grumous blo
bloody serum, which imparts to it a dark color. The only disease with wh
might be confounded, especially in its earlier stages, is inguinal hernia; but
this it may generally be easily distinguished by the history of the case, the imm

bility of the swelling, and, if need be, by the introduction of the exploring needle. The tumor sometimes acquires an enormous bulk and weight. Thus, in a case reported by Mr. Bowman, of London, it reached down to the knee, and was so heavy as to require both hands to raise it. The treatment is the same as for hematocele of the vaginal tunic of the testicle. Care is taken not to make too early an incision, lest difficulty should arise in regard to securing the vessels, the rupture of which has caused the disease.

Fig. 597.



Encysted hematocele of the cord.

5. *Varicocele.*—By varicocele is understood a dilated and tortuous state of the veins of the spermatic cord. It generally arises soon after puberty, but occasionally it occurs later, and now and then I have met with it as early as the eleventh year. It is almost exclusively confined to the left side, for the reason, as Dr. Brinton, of this city, has demonstrated, that the left spermatic vein at its entrance into the emulgent is unprovided with a valve, whereas such an arrangement exists distinctly on the right side, where the vein embogues into the vena cava. Besides, the left vein is naturally considerably longer than the right, and its direction also is more at a right angle with the current of the blood.

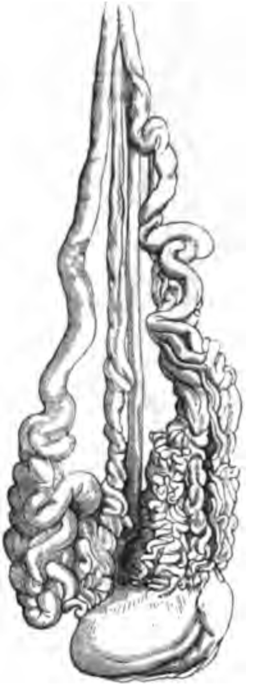
The affection may be induced by whatever has a tendency to facilitate an afflux of blood to the genital organs, or to serve as a habitual barrier to its return to the heart. Hence the most common causes are, venereal excesses, masturbation, chronic disease of the scrotum and testicle, riding on horseback, bodily fatigue, and pressure on the spermatic vessels from distension of the iliac portion of the colon, the presence of tumors in the groin or pelvis, and the wearing of ill-constructed trusses. Constant relaxation of the scrotum, however induced, powerfully predisposes to the formation of the disease. It is very probable that there exists in many cases, if not in most, a natural tendency to this enlargement. What corroborates this idea is that it often begins very early in life, before the causes here referred to can exert any injurious influence, and the fact that it occasionally occurs in several members of the same family.

Varicocele is usually slow in its progress, and is attended with a dull, heavy, aching pain, which often extends up the cord to the groin and even to the back. In some cases the pain is of a neuralgic nature. A sense of weight is commonly experienced in the testicle, which, in time, is liable to become soft and shrunken, from the pressure of the enlarged and distended veins. The scrotum of the affected side is very prone to perspiration, and is often remarkably flabby, elongated, and pendulous, especially after exercise. The general health rarely suffers; but in many cases there is a gloomy and melancholy state of the mind, almost bordering upon alienation, and unfitting the patient for active exertion.

When the disease is fully developed, the veins are convoluted, knotty, elongated, harder in some places than in others, and irregularly dilated, some of them being more than six times the ordinary volume, as seen in fig. 598. Their parietes are very thick, dense, and rigid at some points, and very brittle and attenuated at others. In cases of long standing, some of the vessels are completely obliterated by adhesive inflammation, or by the formation of fibrinous concretions. Phlebolites are also occasionally found in them. The connecting cellular tissue does not experience any particular alteration, but the veins of the testicle itself are often considerably enlarged, as are also those which ramify between the vaginal and albugineous coats.

The tumor resulting from the enlarged and dilated veins is of an elongated, conical shape, irregular and compressible, feeling very much like a bundle of cords, a cluster of earth-worms, or a mass of the intestines of a rat. It has neither the regular outline and elastic feel of hydrocele, the firmness and globular character of sarcocele, nor the doughy consistence of scrotal hernia. The distended vessels are frequently distinctly visible through the skin. When the tumor is very voluminous, it may extend from the lower margin of the testis to the external ring; and in this case there is always considerable enlargement of the subcutaneous veins of the scrotum.

Fig. 598.



Varicocele.

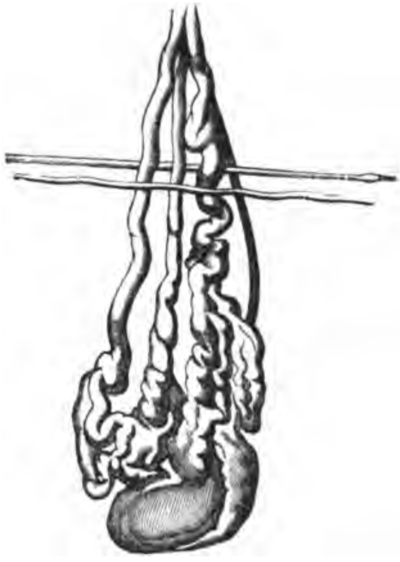
Although the symptoms of varicocele are usually well marked, the diagnosis is not always readily determined. The affection for which it is most liable to be mistaken is scrotal hernia, especially that variety in which the omentum is concerned. In order to distinguish between the two diseases, the patient is placed on his back, and the scrotum held up until it is entirely empty; the finger is then applied to the external ring, and the patient requested to rise, when, if the tumor is a varicocele, it will immediately reappear, whereas, if it be a hernia, the bowel will be unable to descend. A more certain mode of determining the diagnosis is to compress the neck of the swelling, in the erect position, when, if composed of intestine, it will remain stationary, but become more tense if it consists of dilated veins.

The *treatment* of varicocele is palliative and radical. The former, which, in ordinary cases, is alone resorted to, consists in wearing a gum-elastic bag, in washing the parts frequently with cold water, or some astringent lotion, and in carefully avoiding everything calculated to favor a determination of blood to the spermatic vessels. To obtain full advantage from these measures, the patient must pay strict attention to his bowels, and refrain from horseback exercise, fatiguing walks, protracted standing, dancing, warm bathing, and venereal excesses.

For the *radical* treatment, which may become necessary when there is much local suffering, with danger of atrophy of the testicle, or when the patient's mind is so much affected as to render him unfit for active exertion, various operations have been proposed. With some of the ancients the actual cautery was a favorite remedy; Gooch and other surgeons have reported cases cured by castration; some prefer ligation, others excision, of the affected veins; occasionally the spermatic artery has been tied; in the hands of Breschet, compression with a pair of flattened screw-forceps is said to have frequently succeeded; Sir Astley Cooper has recommended excision of a portion of the scrotum; and Velpeau, Davat, Frické, Grossheim, Reynaud, and Vidal, have each devised and practised ingenious subcutaneous operations for its relief. The method which I formerly employed consisted in exposing the enlarged veins, and strangulating them with the twisted suture. The scrotum having been rendered tense by grasping it behind with the left hand, a vertical incision, about an inch in length, was made over the anterior part of the swelling, down to the vessels, which were then carefully isolated from the accompanying duct, artery, and nerves, by a few touches of the point of the scalpel. A slender darning-needle was next passed underneath the enlarged trunks, and secured by passing around them a stout thread, in the form of the figure 8. The operation was finished by closing the wound with one or two twisted sutures. In twenty-four hours the large needle was removed, and the strangulated mass divided with a narrow bistoury.

I had performed this operation with the most gratifying results in fifteen cases, when one of my patients unexpectedly perished from phlebitis; a circumstance which led me to abandon it. Of late years, I have limited myself altogether to sub-

Fig. 599.

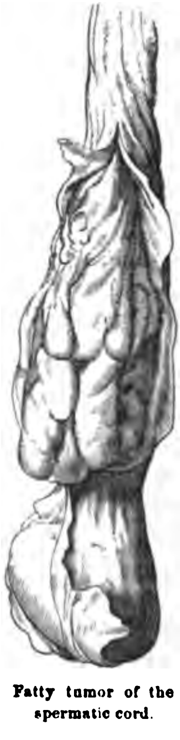


Operation for varicocele.

cutaneous ligation, which I believe to be perfectly safe under all circumstances, as well as permanently successful. The operation consists in ligating the enlarged veins, previously isolated, fig. 599, from the deferent tube, with a stout cord, well waxed, or, what is less likely to cause trouble, a silver wire, and passed with a long spear-shaped needle, from before backwards, by making only two punctures, one in front and the other behind, as is easily done, simply by compelling the instrument to retrace its steps. The ends of the ligature are then firmly tied over a perforated button, or a piece of cork, care being taken to tighten them occasionally. If wire be used, the ends are twisted instead of being tied. At the expiration of a week, it may usually be withdrawn, the veins being sufficiently divided and occluded to prevent a return of the circulation. The patient is kept in bed upon light diet, with the scrotum well suspended, and constantly wet with cold water, half a grain of morphia being administered immediately after the operation, which is always performed with the aid of chloroform. The hardness and swelling, consequent upon the ligation of the veins, gradually disappear spontaneously, or under the influence of sorbefacient applications.

When the scrotum is very flabby and pendulous, the superfluous portion should be retrenched with the knife; care being taken to tie up every bleeding vessel, and to approximate the edges of the wound with the continued suture, which answers much better here than the interrupted. I have performed this operation several times with very excellent results.

Fig. 600.



Fatty tumor of the spermatic cord.

6. *Fatty Tumors.*—The spermatic cord is liable to accumulations of adipose matter, constituting what is called a fatty tumor. The deposit begins in the connective tissue, and occurs either as a distinct, circumscribed tumor, as in fig. 600, composed of numerous lobes, held together by cellulo-fibrous substance, or as an elongated, undefined mass, extending for many inches along the cord. The morbid growth is sometimes associated with hernia of the groin, and, from its doughy, inelastic feel, indolent character, and fixed position, is liable to be mistaken for an irreducible omentum. So long as it causes no inconvenience, no surgical interference is required, but extirpation will be necessary when it becomes painful or oppressive from its weight and bulk.

7. *Encysted Tumors.*—An encysted tumor, consisting either of a solitary oval or globular cell, or a group of cysts, of variable size and shape, has occasionally been seen in the spermatic cord, but the occurrence is too infrequent to be of any practical interest. Nannoni states that he had met with hydatids in the spermatic cord, but as he has not given a detailed account of the case, it is uncertain whether the disease was really of this character.

8. *Spasm.*—The spermatic cord is occasionally the seat of *spasm*, evidently

caused by irritation of the cremaster muscle, either as a result of [illegible] disease of the kidney, the passage of a calculus along the ureter, or [illegible] the urethra. The spasm comes on suddenly, and is characterized by [illegible] ble retraction of the testicle, which is firmly pressed against the [illegible] minal ring. The patient usually experiences more or less pain and [illegible] in the part during the continuance of the attack, as well as for [illegible] The affection is to be treated with anodyne fomentations, the cold [illegible] ing embrocations, and the belladonna plaster, with attention to the [illegible] irritation.

9. *Specific Diseases.*—Finally the spermatic cord is liable to [illegible] carcinomatous disease. In syphilitic sarcocele, the cord, especially [illegible] portion of its extent, is generally very much thickened and indurated, [illegible] like a piece of sole-leather, painful, and tender on pressure. Great [illegible] of the cord also frequently exists in encephaloid and other forms of [illegible] the testicle and scrotum, but it is questionable whether it ever suffers [illegible] from these affections.

SECT. V.—AFFECTIONS OF THE PENIS.

This organ is liable to inflammation, gangrene, wounds, morbid [illegible] ulcers, degeneration of its sheath and septum, carcinoma, and a peculiar [illegible] tion usually associated with abnormal shortening.

1. *Inflammation* of the penis may either begin in this organ, or be [illegible] to it from the neighboring parts, as the scrotum, groin or pubes. [illegible] caused by external injury, or specific disease, as chancre or gonorrhœa [illegible] sionally assumes an erysipelatous character, and produces great pain and [illegible] of the entire organ, accompanied with a constant tendency to erection[illegible] affection, however induced, is easily recognized, and usually promptly [illegible] the ordinary antiphlogistic measures.

The more severe forms of inflammation of the penis are occasionally [illegible] by *gangrene*, especially when the disease has been induced by chancre [illegible] son of an anemic, broken-down constitution. The destruction may in[illegible] entire organ, or it may be limited to certain portions, as the glans or [illegible] The treatment must be conducted upon general principles.

2. *Wounds* of the penis may be accidental or self-inflicted, and may [illegible] themselves in various forms and degrees. Whatever their character [illegible] they are apt to be followed by pretty copious hemorrhage, and by tro[illegible] erections.

Gunshot wounds of the penis are uncommon, perforation of the organ [illegible] rendered difficult by the toughness of the envelops of the erectile tissues[illegible] the battle at Bull Run, I saw a case in which the ball passed completely [illegible] the head of the penis, leaving two openings, which, however, soon healed[illegible] the missile carries away a portion of the urethra, infiltration of urine may [illegible] especially if the use of the catheter is neglected; in any event, a fis[illegible] be likely to be left. A gunshot wound of the root of the cavernous b[illegible] liable to be followed by impotence, from the inability of the patient to [illegible] erections. Dr. S. W. Gross has recorded a case in which a conical [illegible] encysted in one of these structures, its point presenting towards the pub[illegible] which it was separated about one inch. The man experienced so little [illegible] venience that he refused to have it extracted.

The *treatment* must be regulated by the same precepts as in similar inj[illegible] other parts of the body. When the organ is partially separated by a [illegible] stitches should be freely used, along with strips of collodion and splint[illegible] being taken afterwards to prevent displacement by guarding against the [illegible] rence of erections. In the event of complete severance, reunion may rea[illegible] be expected to ensue, provided the parts are promptly and effectually re[illegible] to their natural position over the catheter. Cold water-dressing ordinarily [illegible] stitutes the best application.

3. *Laceration* of the fibrous sheath of the cavernous body of the penis i[illegible]

sionally met with; generally as a consequence of a blow while the organ is in a state of inordinate erection, during sexual intercourse, or in the act of onanism. The occurrence of the accident is generally denoted by a feeling as if something had suddenly given way, instantly followed by collapse, and by a copious extravasation of blood, distending the organ in every direction, and rapidly diffusing itself over the neighboring parts, as the scrotum, perineum, and even the pubes. Sometimes a distinct noise is heard, at the moment of the rupture, not unlike the crack of a whip. The penis is commonly inclined a little towards the sound side, and the site of the injury is readily distinguished by the finger.

The *treatment* of this affection is by rest of the penis in an elevated position, with discutient applications, as saturnine and spirituous lotions, followed by dilute tincture of iodine, soap liniment, and tincture of arnica and camphor. If blood is extensively effused into the cavernous structure of the penis, a free incision should be made, to squeeze out the clots, otherwise they may become intermixed with lymph, and thus undergo partial disorganization, much to the detriment of the functions of the organ.

4. The penis is liable to *strangulation*, the accident being generally caused by the application of a ligature, fillet, or metallic ring, designed either as a means of relieving incontinence of urine, or as a self-inflicted punishment for morbid erections. When the constriction is unusually tight, or long continued, mortification may ensue, as in the celebrated case of J. L. Petit. The treatment obviously consists in dividing the foreign substance, whatever it may be, with the scissors, file, or pliers, and then scarifying, if need be, the infiltrated and distended parts.

Mr. Liston met with a very curious case of disease of the penis in a man upwards of fifty years of age, who, early in life, had slipped a brass curtain ring over the organ to prevent incontinence of urine. Inflammation and ulceration soon followed, and by degrees the ring became concealed below the skin, where, after many years of comparative harmlessness, it was finally incrusted with calculous matter, seriously interfering with micturition, and ultimately necessitating an operation for its removal.

5. *Phlebitis* of the penis is uncommon. I have, however, observed several well-marked cases of it in the dorsal veins, as an effect, apparently, of irritation produced in sexual intercourse. Sometimes it is a consequence of gonorrhœa. The disease, which is occasionally associated with angeioleucitis, is characterized by a phlogosed, turgescent appearance of the organ, and by a tender, corded, and enlarged state of the dorsal veins, extending as far back as the root of the penis. Rest and elevation of the organ, the application of saturnine and anodyne lotions, light diet, and a brisk purgative, constitute the proper treatment.

6. *Morbid erections* of the penis may be produced by inflammation, followed by an effusion of lymph into the cells of the cavernous bodies. I have never inspected a case of this kind after death, but observed one several years ago in a young mechanic, which lasted for nearly four weeks, in spite of the most rigid antiphlogistic measures. It came on soon after intercourse, and was attended with excessive pain, together with much constitutional disturbance. For several months after the violence of the disease had abated, the organ remained small, flaccid, and incapable of complete erection. Sometimes the priapism is occasioned by an effusion of pure blood, in which case, if the fluid is not removed, the individual becomes permanently impotent. Priapism of a severe character sometimes supervenes upon injury of the spine and cerebellum. It may also be caused by the inordinate use of cantharides.

Ordinary cases of priapism are treated with cold applications, and with the liberal use of anodynes, exhibited either by the mouth or by the rectum. In the more severe forms, bleeding at the arm and by leeches, active purgatives, antimonials, and even slight ptyalism may be necessary. If retention of urine takes place, relief must be afforded with the catheter. When the morbid erections depend upon an effusion of blood, free incisions should be made to turn out the clots; if not all, as many as possible.

7. *Ulcers* of the penis, specific and non-specific, are described in the chapter

on syphilis, and need not, therefore detain us here, beyond the statement that the subject is one of great practical importance, both as it respects the peace of mind and the physical welfare of the patient. I am satisfied, from much observation, that the most simple ulcers of the penis are frequently mistaken for syphilitic, and that, in consequence of these errors of diagnosis, persons are constantly subjected to severe courses of mercury that would get well in a very few days under the most simple treatment. I have seen many a constitution permanently ruined in this way.

8. The pectiniform septum of the penis is liable to the *fibrous transformation.* I recollect a curious instance of this kind in a patient of Dr. George McClellan, for whose relief he was obliged to perform an operation. The man was between fifty and sixty years of age; the disease had been coming on gradually; and the organ was curved towards the perineum to such a degree as to interfere materially with copulation. The operation, which consisted in the excision of the offending substance, was entirely successful. Such a lesion, as may readily be conceived, might become a cause of impotence.

The fibrous sheath of the cavernous body is sometimes affected in a similar manner as the pectiniform septum. The transformation, according to my observation, is most common in subjects from thirty to forty years of age, and usually occurs in small patches, from the size of a three-cent piece to that of a dime. Persons who indulge much in sexual intercourse are, I believe, most liable to it. When several such spots exist, they may interfere materially with the erection of the penis, and thus become a source of great mental annoyance to the individual, seriously compromising his happiness.

The *treatment* of these affections is not very satisfactory. In their earlier stages, benefit may accrue from the application of sorbefacients, and subcutaneous scarification; but when the deposit is old, firm, and thoroughly organized, nothing short of excision will answer. The operation is sufficiently easy, and is not attended with any serious hemorrhage.

9. The penis is liable to *carcinoma,* chiefly of the epithelial form. The disease usually begins as a little wart, tubercle, or fissure, on the head of the penis, or the foreskin, from which it gradually spreads to the other structures, until the greater portion is destroyed. The resulting ulcer is at first quite small and superficial; by and by, however, it becomes broader and broader, and, at last, throws out a cauliflower-like fungus. There is now a profuse discharge of thin, sanious, and offensive matter, the inguinal glands rapidly enlarge, and the patient is harassed with severe, lancinating pains, darting up towards the abdomen, his constitution being at the same time completely undermined by the local disease. Cancer of the penis is most common in old men, and its occurrence is generally supposed to be favored by the existence of a long and tight prepuce. Of the truth of this opinion, however, my own experience has not furnished me with any examples.

Cancer of this organ pursues a comparatively tardy course, and does not relapse so soon after removal as cancer in other parts of the body. In one of my cases, that of a medical gentleman, upwards of fifty, five years have elapsed since the operation, and still there is no sign of a return of the malady. Sooner or later, however, the disease breaks out again, despite of all that can be done to prevent it. When amputation is performed, the knife must always be carried freely through the sound tissues. No operation is, of course, proper when there is serious lymphatic involvement.

10. *Incurvation* of the penis is a congenital affection, complicated with abnormal brevity and hypospadias or malformation of the urethra, which is either deficient, or opens some distance behind its usual situation. The consequence is that the organ is bent very considerably backwards towards the scrotum, exhibiting thus not only an unseemly appearance, but interfering materially with copulation.

To remedy this defect, an ingenious operation has been devised by Professor Pancoast, consisting in the excision of a V-shaped portion of the cavernous bodies, the first incision being made immediately behind the head of the penis

The portion excised should just be large enough to relieve the deformity, and no more. No skin is removed, and care is taken not to interfere with the urethra. The arteries, generally three or four in number, being secured, the edges of the wound are carefully approximated by the interrupted suture, carried through the fibrous sheath of the cavernous bodies, the edges of the integuments being tacked together separately. The organ is then placed in an elevated position upon a gutta-percha or leather splint, and kept constantly wet with cold water. Erections are controlled by the usual means. The stitches are removed in from five to eight days. No untoward symptoms follow the operation, and the result is most gratifying. The whole procedure, it will be perceived, is similar to that involved in Barton's operation for the cure of anchylosis.

11. The cavernous bodies of the penis are liable to *aneurism*, consisting in an abnormal dilatation of their cells. The affection, which is exceedingly uncommon, may be either congenital or acquired, and is characterized by the existence of a soft, spongy mass, susceptible of temporary expansion, and the seat of faint pulsation. It rarely involves the entire circumference of the cavernous bodies, much less their entire length. The diagnosis may usually be readily determined by the history of the case, and the peculiar nature of the enlargement. The skin generally remains sound. Albinus has recorded the particulars of such a growth which was punctured under the supposition that it was an abscess. The consequence was a copious hemorrhage, of which the patient died in a few days.

The most reliable remedies are injections of persulphate of iron, and subcutaneous ligation. When the case has been neglected, or the organ has become enormously enlarged, amputation may be required.

12. *Amputation* of the penis, rendered necessary on account of cancerous disease, is one of the easiest operations in surgery. The integument being slightly retracted by an assistant, the surgeon embraces the penis, behind the seat of the disease, with a pair of slender polyp-forceps, inclining a little obliquely from behind forwards, and then, with one sweep of a small catlin, or large bistoury, severs it from above downwards. The arteries being drawn out and tied, the mucous membrane of the urethra is tacked at four different points of its extent to the edges of the cutaneous portion of the wound, the object of the procedure being the prevention of contraction of the canal, which is so liable to follow the ordinary operation. No catheter need be inserted during the cure.

SECT. VI.—AFFECTIONS OF THE PREPUCE.

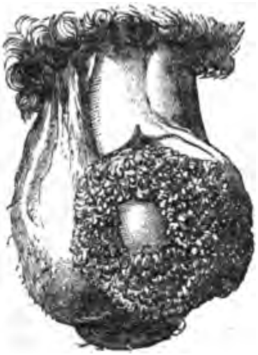
The prepuce is liable to various kinds of ulcers, warty excrescences, phimosis, paraphimosis,.hypertrophy, and the formation of calculous concretions.

1. The *herpetic ulcer* is observed chiefly in young adults, on the inner surface of the prepuce, or at the junction of the skin and mucous membrane. It manifests itself by inflamed spots, of a bright red color, varying in size from that of a millet-seed to that of a split pea. Small vesicles soon succeed, of a globular shape, remarkably transparent, agglomerated, and containing at first a serous, and subsequently a puriform, fluid. On the internal surface, these vesicles lead to the development of thin, flat scales, which fall off about the fifth day, leaving a corresponding number of round, yellowish excoriations; on the external surface, rough, irregular scabs form. By running together, these ulcers occasionally form one unbroken sore, occupying nearly the whole of the prepuce. This disease is very apt to recur, and is usually attended with some itching, but rarely with pain. The exciting causes are friction, want of cleanliness, and disorder of the digestive organs. Persons of a delicate skin, and of a red complexion, are most prone to its attacks. The diagnosis between herpes and chancre is described in the chapter on syphilis.

The *treatment* consists in the use of a brisk purgative, and light, cooling diet, with frequent ablutions of the affected surface, and the steady application of lint saturated with weak solutions of tannin, zinc, or lead, or with very weak yellow wash, as one-fourth of a grain of the bichloride of mercury to the ounce of lime-water. The dilute ointment of the nitrate of mercury is also an excellent remedy. Mercury should never be used internally.

2. The *psoriasic* ulcer is most frequently met with in persons whose foreskin is unnaturally long, moist, and tender. It is an obstinate and painful disease, characterized by deep cracks, or fissures, on the edges of the prepuce, which becomes gradually thickened, hardened, and so corrugated as to occasion phimosis. The number of ulcers is sometimes quite considerable; they are very tender and unseemly; apt to bleed when injured; extremely difficult to heal; and, if large, attended with a copious, puriform discharge. Small, brownish-looking scales occasionally form on these sores.

Fig. 601.



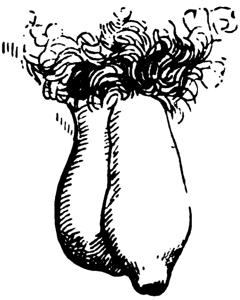
Warts on the penis.

The causes and treatment of psoriasis of the prepuce are similar to those of herpes. When the disease is unusually obstinate, slight ptyalism, maintained for several weeks, is sometimes necessary.

3. The penis, as seen in fig. 601, is liable to the development of *warty excrescences*, as a consequence, chiefly, of gonorrhœa, or of impure connection with females laboring under leucorrhœa and other discharges. Although they may occupy any portion of the organ, they are most common around the neck and at the side of the frenum, where they often occur in immense numbers, from the size of a pin-head up to that of a small hickory-nut; they are usually of a conical shape, with a rather small pedicle, rough, fissured, or tuberculated, of a firm consistence, of a bright florid color, and of a fibrous structure. When these vegetations are very numerous, they form a large tumor, or a series of agglomerated masses, beneath the prepuce, discharging an abundance of horribly fetid pus. They frequently bleed on the slightest touch, and are always extremely prone to recur after extirpation.

The most effectual remedy for these warty excrescences, in their earlier stages, is chromic acid, applied with a piece of soft wood, their surface having previously been divested of moisture. Repetition is effected every third or fourth day, the parts being in the meantime frequently washed, and kept asunder by the interposition of dry lint, which is also one of the best means for preventing relapse. In the more simple cases, excellent results are produced by sprinkling the growths thoroughly twice a day with equal parts of subacetate of copper, tannin, and powdered savin. When the excrescences are very large and old, hardly anything short of excision will be likely to do any good. The operation is easily performed with the scissors, but is always very painful, and occasionally quite bloody. Dry lint is applied after the bleeding has ceased, and the next day the surface is gently touched with chromic acid. If the patient object to the knife, a good substitute will be found in the Vienna paste, care being taken that its influence does not extend into the sound parts. When the repullulating disposition is very strong, recourse should be had to the use of iodide of potassium, with minute doses of bichloride of mercury, although, in general, constitutional means are unnecessary, if not useless.

Fig. 602.



Phimosis.

4. *Phimosis*, represented in fig. 602, consists in a contracted and elongated condition of the prepuce, attended with an inability to uncover the head of the penis. It presents itself in two varieties of form, the congenital and the acquired. In the first, the narrowing of the prepuce depends chiefly, if not exclusively, upon the tightness of the mucous membrane the other component parts retaining their natural character; in the other, all the structures are condensed by inflammatory deposits, the result usually of gonorrhœa and chancre. However induced, the affection requires

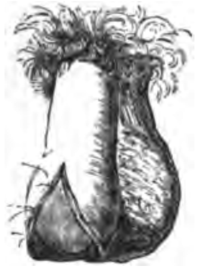
proper attention, as it always interferes with cleanliness and comfort, if not also with copulation. It has been supposed that, by retaining the irritating secretions of the sebaceous follicles, it might become an exciting cause of cancer of the penis and prepuce, but the opinion does not seem to be well founded.

When the tightness exists with unusual elongation of the prepuce, the proper procedure is circumcision. With this view, the redundant parts, steadied with a pair of slender forceps, applied just in front of the head of the penis, are cut off with one sweep of a long bistoury from above downwards and from behind forwards. The contracted and tightened membrane is then, if necessary, divided with the scissors. Any little arteries that may bleed are secured with fine ligatures, when the muco-cutaneous edges of the wound are approximated with four sutures, placed at equidistant intervals. Elevation of the penis, with cold water-dressing, recumbency, light diet, and a purgative the morning after the operation, constitute the after-treatment. The sutures are removed at the end of the third day.

When a person affected with phimosis is laboring under the hemorrhagic diathesis, the safest plan will be to include the redundant parts in a ligature, as, in such an event, the use of the knife might be followed by fatal bleeding.

When phimosis is unattended by elongation, relief may be afforded by slitting up the prepuce in front, along the middle line, over a grooved director, as far back as the posterior extremity of the glans, the edges of the wound being afterwards tacked together by several points of the interrupted suture, as seen in fig. 603. The angles of the flaps are gradually rounded off, assuming, ultimately, a very seemly appearance. Or, instead of this, we may adopt the method of Cullerier, of dividing the tightened mucous membrane, at three or four points, with a delicate pair of scissors, the sharp blade of which is thrust into the connecting cellular substance, and carried as high up as the origin of the prepuce, while the blunt-pointed one glides harmlessly over the head of the penis.

Fig. 603.

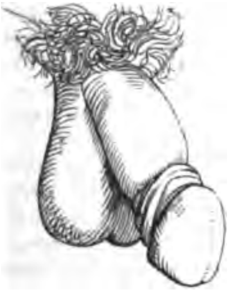


Operation for phimosis.

The acquired form of phimosis often disappears of its own accord, or under the influence of sorbefacient applications, as mercurial ointment, or dilute tincture of iodine, and frequently-repeated pressure with the thumb and finger. When intractable, it must be treated upon the same principles as congenital phimosis; by excision, or excision and incision.

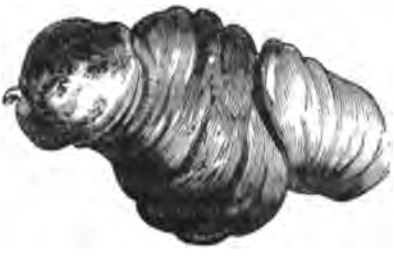
5. *Paraphimosis*, fig. 604, is the reverse of phimosis, and is always an accidental occurrence, causing a stricture just behind the head of the penis, which, in severe and neglected cases, may not only produce great suffering, but mortification of the strangulated tissues; or, at all events, great swelling, pain, and tenderness, from inflammatory deposits, especially the serous, as seen in fig. 605. The accident is usually caused by retracting the prepuce with a view of unco-

Fig. 604.



Paraphimosis.

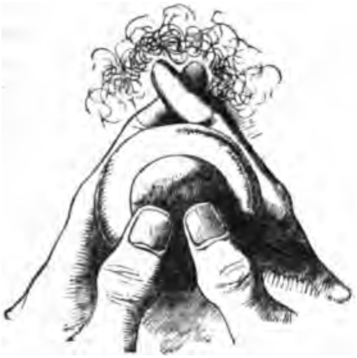
Fig. 605.



Paraphimosis, the parts being highly inflamed and swollen.

vering the head of the penis, the person being afterwards unable to restore it to its proper position. Inflammation soon arises, followed by the symptoms just described.

Fig. 606.



Operation for paraphimosis.

The proper *treatment* in paraphimosis is to restore the parts as promptly as possible to their natural relations, which may always be done without difficulty soon after the accident, but often not without great trouble when severe inflammation and swelling exist. The proper procedure, in ordinary cases, consists in applying pressure to the head of the penis and the dislocated prepuce in opposite directions, by means of the thumbs and fingers, arranged in the manner exhibited in fig. 606. The best plan usually is to squeeze out the blood as much as possible from the turgid glans, before we attempt to push the prepuce forwards. Sometimes this object may be greatly facilitated, especially in recent cases, by pouring upon the part, from a considerable height, a steady stream of cold water. When the prepuce is hard and œdematous, the serum should be well drained off by numerous small punctures before any attempt is made at reduction. When restoration is impracticable by the means now described, recourse must be had to the division of the stricture, which is a very simple affair, all that is necessary being a small incision through the constricted skin, just behind the crown of the penis. Cold water-dressing for the first few days, and afterwards sorbefacient applications, will be necessary to place the parts in a healthy condition.

6. *Enlargement* of the prepuce, amounting sometimes to enormous deformity, is liable to occur; generally as a consequence of interstitial deposits from severe and long-continued inflammation, such as that which attends phimosis or paraphimosis, especially the latter. Occasionally a good deal of serum accompanies the plastic effusion, giving the parts a pale, rose-colored, œdematous aspect, and readily admitting of pitting under pressure. When the lymph becomes organized, as it is apt to do when the irritation is protracted, the prepuce may acquire a most unnatural bulk, causing great deformity, and seriously interfering with, if not entirely preventing, copulation.

The *treatment*, in the milder forms of the affection, is sufficiently simple, being limited, in great measure, to the use of sorbefacient applications, as the dilute tincture of iodine, or a weak solution of hydrochlorate of ammonia, aided by frequent punctures, to facilitate drainage, especially when there is much distension from serous deposits. Sometimes strapping answers a good purpose. When the enlargement is unusually great and firm, or presents the characteristics of a genuine hypertrophy, incommoding by its weight and bulk, the only feasible procedure is retrenchment with the knife.

7. When the prepuce is very long and narrow, it may become a receptacle for *calculous concretions*, of which some very curious examples are upon record. They are usually composed of uric acid, and vary in size from that of a mustard-seed to that of an almond. Their shape is spherical, or ovoidal, their surface rough or smooth, their color grayish or pale ash. They are formed directly from the urine, which, in consequence of the difficulty of its escape through the narrow orifice of the prepuce, deposits its salts in the abnormal pouch, which is always more or less hypertrophied.

These concretions sometimes exist in extraordinary numbers. Thus, in a specimen in my possession, presented to me by Dr. John G. Kerr, of Canton, China, there are not less than one hundred and three, varying from the volume of a pin's head to that of a pea, their aggregate weight being two drachms. In another specimen, removed by the same gentleman from a man forty-five years old, there is a solitary calculus, closely resembling, in size and shape, the head of the penis. The affection seems to be common at Canton, as Dr. Kerr met with six cases of it in one year.

Dislodgment of these bodies is always readily accomplished by incision of the prepuce. If the parts are greatly hypertrophied, the necessary retrenchment is effected immediately after the extraction.

8. *Hypertrophy.*—Hypertrophy of the prepuce, or of the prepuce and penis, is occasionally observed, principally in the form of elephantiasis. In the latter event, it is generally associated with elephantiasis of the scrotum. The disease, which sometimes commences at an early period of life, is most frequently met with in the inhabitants of warm climates, and may proceed to such an extent as to occasion not only great deformity but complete impotence. In a case related by Wadd, the organ was fourteen inches in length by twelve inches and a half in circumference. The skin is usually very rugose, hard, thick, and insensible; the areolar tissue is changed into a dense fibroid substance; and the cavernous bodies and head of the penis are abnormally large, as well as increased in consistence. Micturition is generally sufficiently easy, and the patient is sometimes able to command erections, even when the organ has acquired an enormous bulk.

The only remedy for this affection, in its more advanced stages, is excision, performed in such a manner as to save, if possible, a sufficiency of skin for the denuded organ. When the disease is in its incipiency, it may sometimes be arrested by a mild mercurial course and by sorbefacient applications.

9. The prepuce is occasionally *cleft* longitudinally, as a congenital defect, the opening extending from its base to its extremity. The edges of the fissure are red and callous, and separated at a variable distance. When the flaps are large, the best plan is to refresh and to unite them by suture, as in the operation for hare-lip, otherwise they should be retrenched, especially if they interfere with copulation.

10. The *frenum* of the prepuce is sometimes at fault. Thus a person may be much annoyed by its excessive shortness. The defect, which is generally congenital, may interfere with the retraction of the foreskin, and even with copulation, by drawing the head of the penis downwards and backwards, especially when the attachment of the part extends as far forwards as the urinary meatus. The proper remedy is division.

Several cases have fallen under my observation in which great vexation was experienced in consequence of the destruction of the frenum by disease or accident. In one of my patients the suffering thus produced amounted almost to monomania. When the case assumes such importance as this, an attempt may be made to remedy the defect by an operation similar to that for hare-lip, the contiguous surfaces of the prepuce and head of the penis being carefully pared and accurately kept together by means of the twisted suture. In the instance above mentioned the result was highly gratifying.

SECT. VII.—GONORRHŒA.

Gonorrhœa is an inflammation of the mucous membrane of the urethra, produced by the contact of a specific virus. This virus, as has been established by numerous experiments, conducted in the most careful and unexceptionable manner, has no properties whatever in common with that of syphilis, notwithstanding it was at one time supposed that they were identical, or, if not absolutely identical, at all events, under certain circumstances, convertible, as it respects their effects. The test of inoculation, however, has thoroughly dispelled this delusion, which could only have had its origin in the fact of the occasional coexistence of gonorrhœa and chancre.

Of the essential nature of the *virus* of gonorrhœa nothing is known; all that has been ascertained respecting it is that it resides in the purulent matter which its presence excites during the existence of the specific inflammation, and that it requires a mucous surface for the development and display of its peculiar action.

Placed in contact with the cutaneous tissue, or with any other ti mucous, it is incapable of producing any other effect than ordinary part, it is true, may slightly inflame, and even suppurate, but the derived possesses none of the properties of gonorrhœal matter, and wholly innocuous. The disease to which it gives rise is strictly of a being exclusively limited in its action to the mucous membranes, esp of the genito-urinary organs, and has the faculty of gradually wearing or of disappearing spontaneously. In all these respects, as well as will hereafter be mentioned, it differs essentially and characteristically poison of syphilis, which is capable, not only of producing a severe lo but also of contaminating the whole system, the blood as well as the of thus engendering a diathesis which is transmissible from the par offspring. How long the virus of gonorrhœa retains its infectious after it has awakened the specific inflammation, is a question which has satisfactorily settled; much will, doubtless, depend upon circumstances, the being comparatively short in some cases, and the reverse in others.

The *term* gonorrhœa, by which this affection is usually designated by E writers, is not happily chosen, as it originally signified a discharge of fluid, the older practitioners having erroneously supposed that the fl accompanies the inflammation was merely an increase of the natural The word *blennorrhagia*, employed by modern French authors, is equally tionable, since it simply implies a flow of mucus, whereas, in true g the discharge is purulent, or composed of a mixture of pus and mu term *clap* is a vulgar expression, denotive of the filthy condition of Capuron has proposed the appellation of *venereal catarrh*, while anoth grapher has given it the name of *puorrhœa*, in allusion to the fact, tioned, that the inflammation is characterized by a discharge of pus. A the term gonorrhœa is objectionable in a scientific point of view, yet as i is well understood by the profession, and, moreover, as it has been sanc long usage, it should not be discarded.

The poison of gonorrhœa, as already stated, is capable of producing its effect only upon the mucous tissues, and its predilection for the genito- mucous surfaces is well know. In the male, the parts usually affected urethra, the head of the penis, and the inner surface of the prepuce; female, the lining membrane of the vulva, vagina, and uterus, is most suffer, the urethra often escaping entirely, even when the attack is of ordinary severity. In both sexes, the disease, in consequence of dire lation, occasionally attacks the anus, the nose, and the conjunctiva, destroying the sight in less than twenty-four hours after the commenc the morbid action.

The period of *latency* of the gonorrhœal poison, or the interval wh venes between the impure connection and the development of the probably does not exceed a few hours, although from three to five days elapse before it exhibits any well-marked symptoms. Occasionally, the peculiar discharge shows itself as early as six, twelve, or fifteen hours on the other hand, cases are seen where it does not appear before the exp of a week or more. There is great diversity, in this respect, in differ dividuals, some being extremely susceptible to the impression of the virus others are almost proof against its attacks in any event. Young men large orifice of the urethra, and a tender, delicate skin, with a predisp herpetic affections of the cutaneous and mucous tissues, are particularly suffer. A long and narrow prepuce, entangling and retaining the virus, is circumstance favoring the development of the disease. One attack of rhœa is no protection against another. We occasionally meet with me literally labor habitually under the disease; no matter what precautio may employ, they can never have intercourse without becoming inoc They contract the affection as easily as tinder catches fire. The smallest of virus is sufficient to kindle the disease.

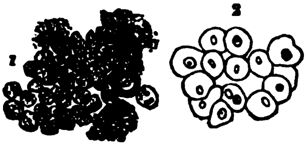
Symptoms.—Gonorrhœa may, practically considered, be regarded as cons of three stages, each of them marked by a certain train of phenomena, giving them a sufficiently distinctive character. The first may be called the formative stage, the second the stage of maturity or full development, and the third the stage of decline.

The first stage, comprising the initiatory steps of the disease, is announced, as its very first symptom, by a sense of titillation along the course of the urethra, especially at its anterior extremity, and by a feeling of turgescence and weight in the penis. Shortly after this, the orifice of the tube is observed to be red and pouting, and glued up with a thin, whitish secretion; the head of the penis has a swollen and phlogosed appearance; some degree of scalding is experienced in voiding urine; and, upon pressing the urethra, a small quantity of watery mucus may be squeezed out. The fluid is merely an increase of the natural secretion of the part; it is somewhat viscid, though hardly as much so as in health, and if any of it fall upon the patient's linen, it is very apt to leave a little darkish stain, the spot feeling slightly stiff.

The first stage seldom lasts beyond a day or two, and occasionally, indeed, not more than a few hours, when it is succeeded by the second. The fire, previously kindled, now bursts forth in a full flame, and the disease soon reaches its acme. Every symptom is declarative of inflammatory action. The discharge is now quite abundant, often amounting to several drachms in the twenty-four hours; of a thick, ropy, cream-like consistence, and of a light-yellowish color, generally bordering upon greenish. In case the morbid action runs very high, it is not uncommon for the pus to contain more or less lymph, thereby augmenting its consistence, and also pure blood, the result, probably, of a rupture of some of the minute vessels of the mucous membrane. The whole penis is very much swollen, tender, and painful, its head being extremely red and congested, and the prepuce enlarged and œdematous; the scalding in voiding urine is violent, and the stream is often much diminished in size; there is a frequent disposition to erections; and the system, sympathizing with the local disorder, is feverish and uncomfortable. When the inflammation is of extraordinary severity, there is apt to be serious involvement of the neighboring parts, along with soreness of the testicles, groins, and perineum, and tumefaction of the veins and lymphatics of the dorsum of the penis.

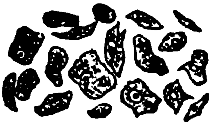
These symptoms may last for several weeks, and they will be very apt to do so unless combated by appropriate means. Sometimes they subside under very simple treatment; at other times, and more generally, active measures are required for their subjugation. As the inflammation abates, the discharge diminishes in quantity, and changes in quality, becoming small, thin, and pale, resembling weak whey, or a thin mixture of mucus, or mucus and pus, in water. Occasionally it is of a thin, turbid nature, or slightly sanguinolent, leaving a characteristic stain upon the patient's linen. There is now comparatively little scalding in micturition; the stream of urine is also more bold; and there is less tendency to morbid erections. The disease, in fact, is in a subacute state; it has lost its severity, and is manifestly on the decline, subject, however, upon the slightest exposure, or from the most trifling irregularity, to a resumption of all its former intensity. In this way it may flow and ebb, now advancing and now receding, for weeks and even months, without any apparent indication as to a final cure. Having reached this point, the term chronic is applied to it, or, as expressive of the nature of the discharge, the word *gleet*, the fluid being of a thin, whitish character, small in quantity, and but little different from the natural secretion, unless it is temporarily changed by a reaccession of inflammation. It is generally somewhat viscid, and hence it is apt to glue together the edges of the orifice of the urethra, particularly in the morning, and after exercise. The quantity of fluid sometimes does not exceed a few drops in the twenty-four hours; at other times, it is more considerable, and then leaves, perhaps, several distinct marks upon the patient's linen. Occasionally almost the only discharge is a whitish, flaky substance, looking very much like little fragments of soft-boiled rice, which is sure to cause the patient a great deal of anxiety, and the surgeon no little annoyance. The different characters of the discharges in the two forms of the disease are well illustrated in the annexed sketches, figs. 607 and 608, from Druitt.

Fig. 607.



1. Discharge from gonorrhœa, all but cured.
2. The same, with acetic acid.

Fig. 608.



Discharge in a case of obstinate non-venereal gleet.

There is a form of gonorrhœa in both sexes, in which, instead of the usual discharge, the parts are remarkably free from moisture, constituting what the older writers were in the habit of calling *gonorrhœa sicca*, or dry clap. It is characterized by a high degree of scalding in micturition, excessive soreness and tenderness in the penis and circumjacent parts, and by a great tendency to morbid erections, the inflamed surface being uncommonly red and congested. The dryness rarely continues beyond a day or two, when it is generally succeeded by an abundant, greenish, muco-purulent discharge, not unfrequently intermixed with pure blood, indicative of the intensity of the morbid action.

Pathology.—The pathology of gonorrhœa is now well understood. It is essentially, from first to last, an inflammation of the mucous tissue of the urethra, the intensity of its action varying in the several stages into which the disease is usually divided. The primary impression is generally made upon the anterior portion of the canal, not occupying, perhaps, more than a few lines of its surface, but as it advances it gradually and sometimes rapidly extends over the greater part of the lining membrane, reaching as far back as the neck of the bladder, and forwards to the head of the penis, and even to the prepuce. But few opportunities have been afforded of inspecting, after death, the urethra of persons affected with acute gonorrhœa, but enough has been learned to show that, when in this condition, its mucous membrane is of a red, florid complexion, from the injection of its capillary vessels, and that there is marked enlargement of its follicles, especially of the lacunæ of Morgagni, which, from their great size in the natural state, would often seem to be obliged to bear the chief burden of the disease, the morbid action frequently lingering here long after it has ceased in the other structures. A knowledge of this fact is of no inconsiderable practical importance, as it serves to explain the astonishing obstinacy which, in many cases, characterizes gonorrhœa, depending apparently upon the difficulty of medicating the interior of these follicles, owing to their depth and peculiar position rendering it difficult to force injecting matter into them. The free surface of the canal is occasionally, perhaps, indeed, not unfrequently, incrusted with little patches of lymph, but this is rather a matter of inference than of actual observation; it is, however, a reasonable inference, deriving confirmation, first, from analogy, or from what occurs in inflammation in other mucous tissues, and, secondly, from the fact that the purulent discharge, when at its height, often contains flakes of plastic substance.

In addition to the above appearances, it is usual to find considerable thickening of the mucous membrane, thus accounting for the diminished size of the stream of urine; and, in the more violent forms of the disease, there is always an effusion of plastic matter into the cells of the spongy substance of the urethra, causing that peculiar incurvation of the penis which attends its morbid erections. When the gonorrhœa extends far back, the glands of Cowper are liable to become involved, and it is well known that the prostate gland, the neck of the bladder, and, in fact, the whole seminal apparatus, not unfrequently suffer, especially when the disease continues uncommonly long in a very active condition. It was formerly supposed that such an amount of discharge as generally attends specific inflammation of the urethra was closely connected with an ulcerated condition of its mucous membrane, but dissection has proved that this is not the case; it is only when gonorrhœa is associated with chancre of this canal, a very rare event, however, that such an occurrence is at all likely to happen.

Complications.—Gonorrhœa may exist in a very simple form, passing through its different stages without infringing in the least upon the rights of any tissues save those primarily and necessarily implicated. In general, however, it encroaches more or less upon the surrounding structures, thus producing those more severe and distressing symptoms which so often characterize the lesion. These secondary affections, or complications, as they may be termed, coming on at a variable period during the progress of the inflammation, are balanitis, chordee, cystitis, retention of urine, epididymitis, bubo, hemorrhage, chancre, phlebitis of the penis, and abscess of the urethra, perineum, and prostate gland.

Gonorrhœa of the urethra occasionally coexists with gonorrhœa of the head of the penis and prepuce, known under the name of *balanitis*, from a Greek word signifying gland. The two affections may arise simultaneously, or one may take precedence of the other, and they may go on together for an indefinite period, though, in general, the latter disappears long before the former, being much more amenable to medication than the disease of the urethra. The reason why the gland does not always participate in the inflammation of the canal is simply because, from its constant exposure and consequent hardness, it loses, in great measure, its susceptibility to morbific impressions. What corroborates this statement is that balanitis, spurious, or preputial gonorrhœa, as it is variously termed, is almost exclusively confined to young subjects with a long, narrow, and very sensitive foreskin. An infection of such a nature is almost unknown in the Israelite, who, in obedience to the requirements of the rites of his church, is compelled to part with this cutaneous appendage at the end of the first week of his life.

The disease is usually well marked from its commencement, the prominent symptoms consisting of more or less pain and itching, along with a discolored and abraded appearance of the inflamed surface, marked tumefaction of the prepuce, which is often quite œdematous, and an abundant puriform discharge, of a peculiarly fetid and irritating character, apparently from the admixture of sebaceous matter, which is always so copiously secreted in this disease. The morbid action is especially severe along the gutter behind the crown of the penis, at the point of reflection of the prepuce, depending upon the remarkably delicate, vascular, and glandular structure there.

The diagnosis is always very easy when we are able to retract the foreskin, but when this covering is unusually narrow it is often very difficult, if not impossible, to determine the precise source of the discharge, as it may, then, proceed entirely from the urethra, or partly from the urethra and partly from the head of the penis. The principal signs of distinction are, the smaller amount of pain and scalding in micturition in balanitis than in urethral gonorrhœa, the more profuse discharge, the more severe swelling, the slighter tendency to chordee, and the more tractable character of the malady. The discharge may proceed from a concealed chancre, but in this case it will not only be thick, but very abundant, and there will, besides, be a circumscribed hardness, easily distinguishable by the touch.

Chordee is the technical name for the morbid erections which attend gonorrhœa; the occurrence is extremely common, and is generally a source of great distress; it is never absent during the height of the inflammation, and is always most severe at night, when the patient becomes warm in bed, or the mind is engaged upon a lascivious dream, an unchaste image, or an impure thought. Its attacks are variable; it often comes and goes several times during the night, and, not unfrequently, it lasts for hours together, causing sleeplessness and excessive pain, the more so because it is entirely involuntary, the organ refusing to be controlled by any effort of the will. In the more violent forms of the disease, it is attended with a remarkable incurvation of the penis, the organ being bent backwards towards the perineum, in consequence of the distension of the cells of the erectile structure of the urethra by lymph, thus preventing the influx of blood necessary to the erection of the affected tissue. When the distension is unequal, the penis is sometimes drawn to one side. Occasionally the cavernous bodies a[illegible] similar manner, though in a less degree.

Cystitis, as a complication of gonorrhœa, is caused by an extension [illegible] inflammation from the urethra to the bladder, along the mucous [illegible] affording thus an example of the propagation of disease by continuity [illegible]ture. It often supervenes at an early stage of the morbid action, and [illegible] exceedingly disagreeable concomitant, being characterized by an al[illegible] desire to urinate, by heat and pain deep down in the pelvis, and by a [illegible] burning or scalding in micturition, especially at the close of the oper[illegible] inflammation is confined, in great measure, to the neck of the bladder [illegible] very severe, it may be accompanied by a discharge of puriform matter [illegible] pure blood, although such an occurrence is very unusual.

In consequence of the inflammatory irritation of the urethra and neck [illegible] bladder, such an amount of spasm may be produced in the latter organ [illegible] rise to *retention of urine*. The affection is characterized, in addition [illegible] symptoms ordinarily present under such circumstances, by excessive [illegible] smarting along the course of the urinary passages, and by a great de[illegible]ness and tenderness in the perineum and anus.

The immediate cause of *epididymitis* is, generally, a repulsion of the [illegible]rhœal inflammation, in consequence of exposure to cold, or the use of [illegible] injections. Rarely supervening before the third week, it is most fre[illegible] the sixth; and, although it commonly begins in the epididymis, it rap[illegible]tends to the testicle, so that the two may be said to be implicated nearly [illegible] equal degree. The swelling and other symptoms are well marked, and [illegible] suffering is often intense, the system frequently deeply sympathizing w[illegible] local disorder. The original seat of the inflammation is the mucous lining [illegible] seminal passages, but it is almost invariably limited to one testicle. T[illegible] 138 cases, collected by Gaussail, D'Espine, and Curling, both organs [illegible] affected only in 11. Of the remaining cases, the right testicle was the [illegible] the disease in 78, and the left in 49. During the height of the inflamm[illegible] and sometimes even at an early period, there is almost always a suppre[illegible] the gonorrhœal discharge.

Bubo is an occasional sequence of gonorrhœa; it is most liable to [illegible] young subjects, after exposure to cold, or severe fatigue, and is usually [illegible] to one groin, the lymphatic ganglions of which become enlarged, tender [illegible] painful, though they rarely suppurate. The swelling may be seated above [illegible]part's ligament, but, in a majority of instances, it will be found below, the [illegible] of ganglions concerned varying from one to three or four.

Hemorrhage of the urethra, as attendant upon gonorrhœa, is an unc[illegible] occurrence; it generally takes place during a violent erection, from rupture [illegible] some of the vessels of the mucous membrane, and may be so considerable [illegible] require active measures for its suppression. There is nothing definite as [illegible] seat, though, in general, it will be found to be located in front of the [illegible] portion of the canal.

The coexistence of gonorrhœa and *chancre* of the urethra is probably [illegible] common than is generally imagined, and it was this circumstance, no d[illegible] which led to the notion, at one time so common among surgeons, of the id[illegible] of the two diseases. As this subject, however, has received due attention [illegible] chapter on syphilis, all that is here necessary is to state that the chan[illegible] usually situated in the anterior extremity of the canal, just within, or a [illegible] beyond, the meatus, where its presence is always indicated by a circums[illegible] hardness, and, not unfrequently, by all the visible signs of an ulcer.

Phlebitis of the penis, as a complication of gonorrhœa, is very uncommon [illegible] generally sets in within the first two or three weeks of the disease, and is cha[illegible]terized by the existence of a hard, firm cord, situated in the course of the d[illegible] veins. The pain is usually considerable, and there is nearly always some deg[illegible] of œdema. No constitutional symptoms attend.

Finally, gonorrhœa is occasionally productive of *abscesses* in the submu[illegible] or subcutaneous cellular tissue of the urethra, preceded by the ordinary phe[illegible] ena of inflammation, and pointing in various situations, sometimes along the spongy portion of the tube, sometimes in the perineum, and sometimes, again, in the region of the prostate gland. Such an occurrence, which, fortunately, is uncommon, is most liable to happen in persons in whom the specific disease is coincident with stricture of the urethra, leading to great difficulty in micturition.

Such is a brief account of the more common and more immediate consequences of gonorrhœa; to complete the history of this part of the inquiry, it is necessary to add that the disease often leads to stricture of the urethra, owing to the protracted inflammatory action of the mucous membrane, and the inevitable effusion of plastic matter into its substance. There is reason to believe, as has been stated elsewhere, that this lesion is much more frequently produced by gonorrhœa than by all other causes combined.

Besides the local effects of gonorrhœa now considered, there are others which are of a general character, and which may, therefore, be said to be *constitutional.* The affections which are usually described as belonging to this category are gonorrhœal rheumatism, ophthalmia, and cutaneous eruptions, more especially some of the scaly forms. These affections are, it would seem, remarkably common in London, in consequence, as is supposed, of the damp, cold, and variable state of the atmosphere so prevalent in the British metropolis. In this country their occurrence is extremely infrequent, and from never having witnessed any instances of them in my own practice, or in that of my friends, either hospital or private, I am strongly inclined to the opinion that their existence is in great degree imaginary. I have certainly seen enough cases of gonorrhœa to justify me in believing that, if these secondary affections were of such frequent occurrence as they are represented to be, instances would occasionally have fallen under my observation, and thus have afforded me an opportunity of studying their history. But no such opportunity has occurred, and I am, therefore, inclined to regard the supervention of these so-called secondary affections, not as a result of the direct action of the gonorrhœal poison upon the system, but as a mere coincidence, taking its place in a constitution strongly predisposed, by hereditary influence, atmospheric vicissitudes, and the debility occasioned by the treatment of the original disease, to the development of rheumatism in various parts of the body, particularly the joints, muscles, and sclerotic coat of the eye. I cannot, indeed, conceive how the subject can be viewed in any other light. All pathologists are agreed that gonorrhœa is strictly a local malady, and that the poison produced by it, although it may be absorbed into the system, is incapable of contaminating the solids and fluids, in the sense in which this question is regarded when the poison of chancre has been conveyed into the body. If gonorrhœa is a constitutional disease in one case, it ought to be so, as a general rule, in all, the same law holding good here as in syphilis, and yet every one knows that this is not true. In warm climates nothing is ever heard of gonorrhœal rheumatism, whereas syphilis, in its secondary and tertiary forms, is unusually rife in all southern and inter-tropical regions.

The *scaly eruptions* of the skin, and the soreness of the throat, affections particularly adverted to by some recent authorities, probably depend upon the absorption of chancrous matter, and not upon any malign agency exerted by the poison of gonorrhœa. This view of the subject will appear the more plausible, when it is remembered that these consecutive affections of the cutaneous and mucous tissues are well-known results of syphilis, especially of its milder forms. It is only necessary to suppose, what, indeed, so often happens in venereal disease, that the patient is simultaneously affected with gonorrhœa and chancre, or that the latter malady has somewhat preceded the former, and all the difficulty with which the subject is invested will at once vanish.

Gonorrhœal *ophthalmia* has been described in a previous chapter, and therefore need not occupy us here. It may present itself in two varieties of form, the conjunctival and sclerotic. The former, when the result of direct inoculation, is a most painful and destructive disease, generally speedily eventuating in gangrene of the cornea and loss of sight. Gonorrhœal sclerotitis is comparatively infrequent; it is a constitutional affection, which commonly coexists with rheumatism in other parts of the body, particularly of the joints, and is charac by the usual phenomena.

Pyemia occurs occasionally as a result of gonorrhœa, chiefly, if not ex in subjects of an anemic, broken-down constitution. The disease appear a variable period after the commencement of the discharge, and is charac the ordinary phenomena, as rigors, followed by high fever, excessive pr aching of the limbs and back, and an icterode condition of the skin. I reveals congestion of the internal viscera, with metastatic abscesses, pu posits in the joints, and inflammation of the prostatic, vesical, and pe

Treatment.—In the treatment of gonorrhœa it is important not to lose of the several stages of which we have considered it as consisting, sin must necessarily exert a modifying influence upon the employment of th peutic measures.

It has been a general belief among the profession, which has been grad gaining ground for several years past, that an incipient gonorrhœa m properly managed, be cut short, or be made to abort. A course of treat consisting principally of injections, aided by repose and light diet, and b the imposing name of *ectrotic*, has, accordingly, been devised by a French grapher, and much insisted upon both by himself and his disciples as if not completely, infallible. The article, serving as the basis of this tion, is nitrate of silver, in the proportion of a quarter of a grain to the of water, and injected every four hours for two successive days, unless found, in the meantime, that the discharge assumes a thin, sero-sang character, the natural effect of the remedy, when it is to be discontinued The intention of this treatment, which, we are told, should be conjoined perfect rest, abstinence from animal food, and the use of diluent drink subvert the specific inflammation, before it is fully developed, by the subst of one of an entirely simple character.

Another plan, the very opposite of the above, as far as the local mea concerned, and of British origin, proposes to attain the same end by the a strong solution of nitrate of silver, containing at least ten grains of th to the ounce of water, and introduced once a day, until there is unequivoc dence of a complete change in the nature of the morbid action. The c devising this mode of treatment is, I believe, usually ascribed to the la Wallace, of Dublin.

I allude to these two modes of practice merely for the purpose of conde them, being satisfied, from ample experience, that, although they may so succeed in arresting the disease in its incipiency, yet, in general, they completely fail, or, what is worse, only aggravate the existing trouble, incr the discharge, pain, and scalding of the urethra, protracting the attack endangering the safety of the epididymis and testicle. A much more rat because a much safer, plan, is to treat the disease, in this stage, with the m possible injections, consisting of a very weak solution of acetate of zinc or in water, the quantity of the salt not exceeding the fourth or third of a g to the ounce. This may be thrown up three times a day, and often exer a remarkably controlling influence over the disease. Or, instead of this injection of two grains of tannin to the ounce of water may be employed se times in the twenty-four hours. Finally, I frequently use, with the hap effect, as an injection, in this stage of the disorder, simple tepid water, table tea, or some mucilaginous fluid, with which a few drops of laudanum been mixed. I have myself always found that the more mild and so the treatment is during the incubative period the more likely it will be to beneficial in arresting the disease, and this is a point upon which it is impo to insist too strongly with the young and inexperienced practitioner, who apt to commit the very serious mistake of employing harsh remedies where of an opposite kind alone are admissible. Along with these means it is in tant that the patient should be kept perfectly quiet, abstaining from meat diments, and stimulating drink; that free use should be made of demu fluids; and that the parts should be well fomented with cloths wrung out warm water. If these means do not produce speedy delitescence, hardly anything else will.

In the second stage, when the disease has become fully established, as denoted by the excessive discharge, the pain and scalding in passing water, and the phlogosed condition of the penis, the treatment must be essentially antiphlogistic, precisely as in any other severe inflammation. The practitioner must lose sight entirely of the specific character of the disease, and look upon it in the light solely of a common affection. If the patient is young and plethoric, he should be bled freely at the arm, and immediately after take a brisk purgative; he should then be subjected to the exhibition of the antimonial and saline mixture, repeated at such intervals and in such doses as will maintain slight nausea and a gentle action on the bowels; perfect repose of mind and body must be enjoined, the diet must be very mild and restricted, and the urine should be rendered as bland as possible by the use of demulcent drinks, as gum water, or linseed tea. If chordee proves troublesome, a full anodyne is given at bedtime.

The local treatment is of the most gentle kind. The complaining organ is placed in an easy, elevated position, and frequently immersed, for half an hour at a time, in a tincupful of tepid water, containing a small teaspoonful of common salt, the object being not only to soothe and relax the parts, but to promote cleanliness. If the pain and swelling be considerable, the whole genitals, together with the hypogastrium and perineum, are kept constantly wet with cloths wrung out of hot water, either simple, or medicated with laudanum or hops, and covered with oiled silk. Under similar circumstances, leeches are sometimes serviceable, from fifteen to twenty being applied to the groin, pubes, and perineum, the flow of blood being afterwards promoted by the ordinary means. The only direct medication during this period is an injection of tepid water, repeated from six to ten times in the twenty-four hours. The diet must, of course, be of a character to correspond with the other measures.

This treatment need seldom be continued longer than three or four days, even in the most severe forms of the disease; at the end of this time, the inflammation is generally sufficiently subdued to justify the employment of what are usually considered, and not without reason, as the specific remedies for this disorder. These are the copaiba and cubebs, whose efficacy in relieving gonorrhœa has long been thoroughly established, so much so that they are used by every one in every case of the disease. By many, indeed, they are habitually employed without any preparation whatever, either of the part or system, in all stages of the affection, from its first inception to its final termination in gleet. In the early part of my professional life, governed by the influences around me, I pursued this practice in common with others, but I soon learned its injurious effects, and, therefore, abandoned it. Its occasional success is indisputable, but more frequently, by far, it allows the disease to go on unrestrained, and the consequence is that, in many cases, it is indefinitely protracted. Hence, I am satisfied that it is always best to precede the exhibition of these and kindred articles by antiphlogistic measures. The inflammation being subdued in this way, the beneficial effects of copaiba and cubebs, especially of the former, are often most rapid and striking.

The dose and mode of administration of the balsam of *copaiba* deserve consideration. Many persons will readily bear a drachm, three times a day, but a smaller quantity than this will generally make nearly as strong an impression upon the disease, while it is much less liable to disturb the stomach and bowels, and cause eruptions of the skin. Indeed, I have often found that a third or fourth of a drachm will answer every purpose for which the article may be given. The most eligible form of exhibition is that of emulsion, prepared by rubbing the balsam up in gum Arabic and extract of licorice, to which are afterwards added camphor water and spirit of nitric ether, with a little tincture of opium. The camphor water is a valuable ingredient on account of its soothing effects upon the genito-urinary apparatus, and may be administered three times daily, in quantities varying from two to four drachms. The dose of nitric ether should not exceed ten or twelve drops, as only the slightest possible impression upon the renal secretion is aimed at. When the copaiba causes acid eructations, nausea, griping, or diarrhœa, a minute portion of morphia, or a few drops of acetated tincture of opium, may advantageously be combined with it. As camphor water is not always agreeable, a good substitute may generally be found in cinnamon, mint, or ginger water. When there is much scalding in voiding urine, or an unpleasant eruption of the skin, I generally add to each dose of the mixture a few grains of bicarbonate of soda, or, what is preferable, enjoin the free use of alkaline and demulcent drinks. The licorice is particularly valuable in disguising the taste of the copaiba.

When the copaiba emulsion disagrees with the digestive organs, it has been proposed to administer it by the rectum, as an injection, but such a mode of medication is not only very inefficient, but extremely disgusting, and has, therefore, found little favor with practitioners. Under similar circumstances, the copaiba capsule is often used, the balsam being thus conveyed, without coming in contact with the gustatory nerves, into the stomach, where, its envelop being dissolved by the gastric juice, it soon enters the circulation, producing an effect like that which results from the use of the emulsion, although less rapid, and, on the whole, also less beneficial. It is for this reason, therefore, that the fluid preparation deserves a decided preference. The number of capsules to be taken in the twenty-four hours varies from three to six, sometimes one, and at other times two, being employed at a dose. There is a preparation of copaiba, formerly much in vogue, but now very justly discarded, on account of its inertness, consisting of a combination of this article with carbonate of magnesia, administered in pill form.

The effects of copaiba may be so distressing as to render it absolutely necessary to abandon its use altogether. In this case, it may be advantageously replaced by *cubebs*, or trial may be made of the two articles in combination, experience having shown that the modifying influence thus produced occasionally enhances their beneficial effects, at the same time that it renders the stomach more tolerant of their presence. The usual dose of powdered cubebs, the only form in which they are administered in gonorrhœa, is one drachm, three times daily, in a little milk, but twice, and even thrice, this quantity may be given without detriment. In fact, it generally requires rather a large dose to produce any marked effect at all.

Of the two articles here mentioned as the great anti-gonorrhœal remedies, the advantages are, in every respect, greatly in favor of the balsam of copaiba, especially when perfectly pure, and given in the form of camphor emulsion. What its mode of operating is, or how its remedial effects are produced, is a matter only of conjecture. It is positively certain, however, that it must make a directly medicative impression upon the affected surfaces, as the odor of the balsam is always very apparent in the urine of those who are using it internally, even if it has only been for a short time. Cubebs also seem to exert a direct influence upon the genito-urinary mucous membrane, but the benefit arising from their use, both immediate and remote, is, as just stated, much less conspicuous than that which follows the exhibition of copaiba.

Along with copaiba, or copaiba and cubebs, direct medication must be employed; for the time has now arrived when *injections* are not only useful, but, in some degree, indispensable in order to corroborate and confirm the cure. A numerous catalogue of articles is at the command of the surgeon, from which to make his selection. The most valuable are the different preparations of lead and zinc, sulphate of copper, nitrate of silver, iodide of iron, alum, bichloride of mercury, and tannin, dissolved in soft water, and employed, either alone or variously combined, to suit the exigencies of each particular case. The great precaution which is necessary in their use, and which experience has taught me is too often disregarded, is to begin with a very mild solution, and gradually to increase its strength as the inflammation subsides, and the urethra becomes more tolerant of the effects of medication. Unfortunately, the opposite of this practice is too often adopted, even by otherwise highly intelligent surgeons, and the consequence is that the foundation is thus but too frequently laid for organic stricture and other serious results, as troublesome to manage as they are distressing and alarming to the patient. A little skill and judgment will usually enable us to avoid this error; for, after all, the proper regulation of injections in the treatment of gonorrhœa is as much a matter of common sense as of a chastened experience. Another excellent practical precept in relation to this class of remedies, is to vary their employment frequently, substituting one article for another as the former loses its effects, and also reducing or increasing their strength in proportion as they prove either too mild or too severe. I know of no branch of surgery where a practitioner may exhibit his knowledge and judgment, in the treatment of diseases, to more advantage, or in a more favorable light, than in that of gonorrhœa. Sometimes the very best injection, in this stage of the affection, is a grain each of acetate of lead and zinc to the ounce of water. Another article which I much employ is the iodide of iron, from one-fourth of a grain to half a grain to the ounce of water. The proper strength of the solution of nitrate of silver is from the fourth of a grain to two grains to the ounce of water; of sulphate of copper one-eighth of a grain; of tannin two to four grains; of alum from one to five grains.

Much of the success of an injection depends upon the manner in which it is administered. In the first place, the syringe should be good; large enough to hold at least two ounces, with a well-working piston, and a long, smooth nozzle. The patient, sitting on a chair or the edge of the bed, inserts the instrument, charged with the lotion, deep into the urethra, the penis being held perpendicularly, and the edges of the meatus firmly pressed against the tube. The fluid is then sent back with some degree of force, so as to reach, if possible, the posterior extremity of the canal, in which it is retained for several minutes before it is allowed to escape. There is no danger of the injection passing into the bladder, or of its causing any harm, if it should do so, as its active ingredients would soon be neutralized by the urine. If the discharge is considerable, the urethra should be washed out previously with tepid water, or, what will answer just as well, the patient should be directed to void his urine a few minutes before each injection.

The frequency of the repetition of the injection must depend upon circumstances. In general, twice a day will suffice, but in some cases it is necessary to perform the operation three and even four times in the twenty-four hours; never, however, unless the fluid is very bland and unirritant. If it causes pain, smarting, or burning, beyond a few minutes, it should either be diluted, or used only once a day. A neglect of this precaution often aggravates the disease and protracts the cure. If the injection is found to disagree, or to prove unavailing, it should promptly be replaced by a more suitable one.

When the disease has reached its third stage, or has degenerated into *gleet*, it generally manifests a disposition to linger, or to remain stationary, with, perhaps, hardly any material variation in its character, for many weeks and even months together. It has, as it were, become inlaid in the mucous membrane, and usually proves extremely difficult to dislodge. It is a case alike annoying to the patient and the surgeon, who often finds his best skill and judgment at fault in selecting a suitable remedy. The best plan, under such circumstances, is for both parties to be patient. At all events, it is certain that the disease cannot be taken by storm. As it is chronic, so also must be the treatment. Very often success may be obtained by very mild and gentle means; perhaps, simply by attention to the diet and bowels, and by the use of some slightly astringent injection, as a grain each of acetate of lead and zinc to the ounce of water, or the one-eighth of a grain of iodide of iron to the ounce; aided by a few drops of balsam of copaiba several times in the twenty-four hours. If the patient is plethoric, or at all inclined so to be, he must be freely purged, and take the antimonial and saline mixture, either by itself, or, as I generally prefer, along with a small dose of copaiba; the diet, too, must be very restricted, and stimulants of every kind must be carefully avoided. In a word, the treatment must be partly antiphlogistic, partly specific. If, on the other hand, the patient is weakly, or in need of a better blood, tonics must be given, among which sulphate of iron and quinine occupy the first rank in point of efficacy, about two grains of each, three times daily, constituting a fair average dose. The tincture of the chloride of iron is also a useful article, and one that has almost acquired the title of a specific in the treatment of gleet, although it really possesses no such property. Its chief value appears to be due rather to its effects as a tonic than to any particular influence which it is capable of exerting upon the genito-urinary organs. It is often advantageously combined, when there is no contra-indication on account of the state of the stomach, with copaiba, or cubebs; and I have now and then, especially when there was unusual atony of the urethra, given it with marked benefit in union with tincture of cantharides, the proper dose being about twenty drops of the former to eight or ten of the latter, in a suitable quantity of water, every eight hours.

The *diet*, in these anemic cases, must also be more nutritious, and material benefit is often experienced from the daily allowance of a small bottle of ale or porter, or a small quantity of Holland gin, which, besides invigorating the digestive organs, generally produces a direct and specific impression upon the urinary apparatus. The patient should take gentle exercise in the open air, and use a cool or tepid shower-bath, followed by dry frictions, morning and evening. In short, no efforts should be spared to improve the general health. Exercise on horseback is to be interdicted, as it tends to exert a pernicious influence upon the affected parts, and, for the same reason, sexual intercourse is to be scrupulously avoided.

The use of cubebs has been highly extolled in the treatment of this class of cases, on the ground of their alleged invigorating effects both upon the part and system. In my own practice, however, I have seldom realized such a result, and I, therefore, long ago ceased to place any confidence in them. If given at all, they should be employed in much larger quantities than in the subacute form of the disease.

Along with the remedies above mentioned, I am in the habit of employing, as a local application, the dilute tincture of *iodine*, in the proportion of one part to four or five of alcohol, pencilling with it the whole under surface of the penis, in the direction of the urethra, twice a day. Of all the topical measures that I have ever used in the treatment of this affection, I know of none that is so efficacious as this in dislodging the specific inflammation from the mucous follicles, where it frequently lingers long after it has left the main surface of the lining membrane. On one occasion, I effected a prompt cure of a gleet of nine months' standing, with a narrow blister stretched along the course of the urethra; the remedy, however, is very severe, and few patients will submit to its employment. Cantharidal collodion is a more elegant application than an ordinary epispastic.

When gleet proves very obstinate, resisting all the ordinary means, however judiciously or perseveringly employed, a speedy termination may often be put to its progress by the use of *heroic injections*, consisting of from twenty to thirty grains of nitrate of silver to the ounce of water, and introduced into the urethra every twelve hours, until there is a free sanguinolent discharge with severe scalding in micturition. In some cases one such operation will suffice to break up the specific disease, but most generally it is obliged to be repeated two or three times before the desired object is attained. However this may be, the treatment is to be followed by injections of some mucilaginous fluid, warm applications to the parts, rest, a full anodyne, and light diet; otherwise the new inflammation might readily extend to the bladder and testes. Instead of the nitrate of silver, I have occasionally used, with excellent effect, the tincture of iodine, in the proportion of twenty-five or thirty drops to the ounce of water, employed in the same manner.

I have said nothing, in these remarks, respecting the employment of *medicated bougies* in the treatment of gleet, so much vaunted by certain practitioners. I have the more willingly passed them by, because I am satisfied that their value has been greatly exaggerated, and that all the good they are capable of doing may readily be effected by the use of injections.

Finally, whatever measures be adopted for the relief of gonorrhœa, considered in reference to all its stages and grades of character, it is a matter of paramount importance, in regard to the permanent cure of this disease, that the treatment should be continued, uninterruptedly, for at least six or eight days after all discharge has apparently ceased. If this precaution be neglected, there is always great danger of a speedy return of the disorder, thus compelling both the patient and practitioner to go through a similar course.

The treatment of the *local complications* of gonorrhœa must be conducted upon general antiphlogistic principles, modified by the peculiar character of each affection. With the exception of chancre, they are to be viewed, not as independent lesions, but as maladies owing their existence entirely to the gonorrhœa, or to the specific inflammation of the mucous membrane, of which, in fact, most of them are merely a continuation.

The *chordee*, which is often such a very troublesome symptom, usually disappears with the inflammation which causes it; hence, antiphlogistics are always the most suitable remedies for combating it radically. But immediate or temporary relief is best secured by antispasmodics, especially morphia and tartarized antimony, half a grain of the former and one-sixth of a grain of the latter being given towards bedtime. Under the influence of this prescription the patient soon falls asleep, copious diaphoresis ensues, and a tranquil night is passed. The same object may generally be readily attained by an opiate suppository, or by an enema of a drachm of laudanum, or of this quantity of laudanum and twenty grains of camphor, dissolved in alcohol, and mixed with some mucilaginous fluid. If the parts are hot and violently excited, they should be covered with cloths wrung out of cold water, and frequently renewed.

The *induration* of the spongy structure of the urethra, caused by the deposition of plastic matter, will gradually disappear under the steady use of mercurial inunctions and sorbefacient lotions, aided by the exhibition of an occasional dose of blue mass, or a minute quantity, thrice a day, of bichloride of mercury.

Cystitis usually readily yields to leeches to the perineum, the warm hip-bath, hot fomentations to the hypogastrium and genitals, and full anodynes with tartarized antimony, to allay spasm of the organ and promote relaxation of the system. In plethoric subjects the lancet may be required. If retention of urine takes place, and antispasmodics fail to afford relief, the catheter must be used, but it should by all means be avoided if the object can be attained without it.

Phlebitis of the penis should be treated with astringent and anodyne lotions, conjoined with rest and elevation of the parts. If the inflammation is severe, a brisk purgative and leeching may be necessary.

If *epididymitis* be present, the lancet, or, at all events, leeches will be required; the bowels are opened with a brisk cathartic, and free use is made of the saline and antimonial mixture, administered in such a manner as to keep up decided nausea. Starvation and perfect rest are enjoined; and the affected organs, carefully suspended, are kept constantly wet with a solution of acetate of lead and tincture of opium, applied either warm or cold, as may be most agreeable to the part and system. No attempt is made by direct medication to re-invite suppressed discharge; as the inflammation subsides this will be sure to return of its own accord, and that without risk of bad consequences. Slight ptyalism may be necessary to rid the glandular structure of induration and swelling; and a careful supervision must for a long time be exercised over the general health.

Bubo is treated antiphlogistically; by rest in the recumbent posture, active purgation and light diet, and by the application of iodine and emollient cataplasms, medicated with acetate of lead, and tincture of opium.

The *hemorrhage* which occasionally attends this disease is seldom so copious as to require special interference; when it does, it will generally be found to yield very promptly to applications of pounded ice in a bladder, aided by compression with the catheter. Internally acetate of lead and morphia may be used.

The coexistence of *chancre* with gonorrhœa always constitutes a serious complication, tending to perpetuate the inflammation, and to endanger the constitution by the absorption of the syphilitic poison. The principal local remedies are, the application of dilute tincture of iodine over the site of the chancre, the use of emollient poultices, and frequent injections, at first of tepid water, and afterwards of tannin and red wine, yellow wash, or a weak solution of nitrate of silver. If the chancre is hard, or difficult to heal, a mild course of mercury will probably be required; and it is astonishing how rapidly, under this treatment, the disease usually subsides. All harsh and irritating remedies are, of course, out of the question.

Abscesses, forming along the course of the urethra or perineum, are to be managed upon the same general principles as abscesses in other parts of the body; antiphlogistically in the first instance, and by free incision afterwards, yet sufficiently early to anticipate serious destruction of tissue and the occurrence of urinary fistule.

For the cure of *balanitis* very simple treatment is generally sufficient. The patient is purged with some cooling medicine, and kept at rest, on a restricted diet, while the parts are frequently bathed with cold or tepid water, and covered, in the interval, with an emollient poultice, or medicated dressings. If the foreskin is too narrow, or too much swollen, to admit of retraction, the use of the syringe will be necessary, simple water, or some gently astringent lotion, as a solution of acetate of lead, or Goulard's extract, being frequently thrown into the preputial bag, both to promote cleanliness and to stay inflammation. Harsh and irritating applications are carefully abstained from. In many cases prompt improvement follows the injection of a solution of tannin and opium in water and red wine. In the chronic form of the disease the use of a very dilute ointment of the nitrate of mercury often rapidly conduces to a cure. Keeping the inflamed surfaces in a state of isolation by the interposition of a piece of soft lint always exerts a salutary influence, and greatly expedites recovery.

If symptoms of *rheumatism* should arise, the ordinary antiphlogistic means must be employed, with Dover's powder, opium, and calomel, or morphia and colchicum at night. When the disease has reached the subacute stage recourse must be had to iodide of potassium, in union with bichloride of mercury, especially if there is evidence of deposits of plastic matter. Tonics and change of air will be necessary when the disease is rebellious. Topically the usual remedies must be used, as saturnine and anodyne lotions, leeches, iodine, and blisters, the latter being particularly valuable in case of copious synovial secretion. No benefit will be likely to accrue from the exhibition of copaiba and cubebs.

For the treatment of gonorrhœal *ophthalmia* the reader is referred to the chapter on the Diseases of the Eye, where the subject is discussed at sufficient length. The conjunctival form of the affection generally proves destructive, despite the best directed efforts of the surgeon. For the sclerotic variety, the most efficient remedies are bloodletting, local and general, calomel and opium, sudorifics, blisters to the nape of the neck, and the application of belladonna to the eyebrows, forehead, and temples.

The treatment of *pyemia* must be conducted upon the ordinary physiological principles. The secretions must be promptly corrected, the condition of the blood improved, and the vital powers sustained.

SECT. VIII.—NON-SPECIFIC URETHRITIS.

The male urethra is sometimes the seat of a non-specific discharge, so closely simulating that of gonorrhœa as to render it very difficult, if not impossible, to distinguish between them, especially when it occurs in married men. It has been supposed that such a disease might be contracted during intercourse with women laboring under leucorrhœa, and other ordinary utero-vaginal affections, and this is probably the fact, the occurrence being the more likely to happen when there exists an unusual proclivity on the part of the urethra to inflammation. A muco-purulent discharge of this canal is occasionally met with in young men, independently of sexual intercourse. I am acquainted with a highly intelligent physician who seldom fails to suffer in this way whenever he labors under dyspepsia or an attack of hemorrhoids, to both of which he is rather subject.

On several occasions the discharge has been coincident with an attack of rheumatism. Children are sometimes affected in a similar manner. In May, 1859, Dr. Bournonville sent to me a male infant, seven months old, from whose urethra there had been more or less of a muco-purulent discharge for upwards of a month. The child had become affected, soon after its birth, with eczema, but this had long ago disappeared, and at the time I saw him he was quite stout and robust. I recollect a boy, between three and four years of age, in whom the disease existed in a marked degree for a number of weeks, and still another, nearly ten years old, in whom the discharge could not have been more thick and profuse, if he had labored under genuine gonorrhœa. Such attacks have their analogy in the vaginal profluvia of little girls.

Simple urethritis is most commonly met with in unhealthy, delicate children, predisposed to cutaneous disease and disorder of the digestive apparatus. Occasionally, it can be traced to the irritation of worms in the alimentary canal, to stone in the bladder, or organic lesion of the anus and rectum, as ulceration and hemorrhoids.

However induced, the symptoms do not differ essentially from those of gonorrhœa. In general, the disease is ushered in by a peculiar itching, or stinging sensation, rapidly followed by heat in the part, unnatural redness of the meatus, and slight scalding in passing water. The discharge is at first thin and gleety, like the white of egg, but it soon becomes muco-purulent, thick, yellowish, and quite abundant. When it follows upon sexual intercourse, it generally sets in within the first twenty-four hours.

The most reliable diagnostic circumstances are, the history of the case, the age of the patient, the suddenness of the attack, the comparative smallness of the discharge, and the facility with which the disease yields to treatment. When such an affection occurs in a married man, or in a man accused of rape, the surgeon cannot be too cautious in the expression of his opinion respecting its true character.

In some cases the disease is quite obstinate; in others, on the contrary, it either soon disappears of its own accord, or it yields to very mild remedies. Diligent inquiry should always be made into the nature of the exciting cause. The general health must be amended, cooling laxatives must be given, and the utmost attention must be paid to cleanliness. If these means do not speedily effect a cure, recourse is had to the administration of copaiba, and the use of astringent injections, in the same manner as in true gonorrhœa. When tonics are required, the best articles will be iron and quinine, with nux vomica. Should the discharge be connected with a rheumatic state of the system, the exhibition of colchicum will be indicated.

SECT. IX.—SPERMATORRHŒA.

A loss of semen is one of the natural consequences of manhood; it is a necessity of the system, and is, therefore, to be regarded as a disease only when it occurs too frequently, or when it is provoked by improper means. When this is the case, it may be followed by the most deplorable results, both bodily and mental.

The great cause of this disorder is masturbation, but it may also be produced by excessive venery, gonorrhœa, stricture of the urethra, elongation and tightness of the prepuce, stone in the bladder, hemorrhoids, fissure of the anus, ascarides in the rectum, and disease of the cerebellum. The irritation on which it more directly depends is seated at the neck of the bladder, the ejaculatory ducts, and the seminal vesicles, the mucous membrane of which is in a state of morbid sensibility similar to that occasionally witnessed in the eye, nose, fauces, and larynx. Masturbation is a common vice among youth, and, once established, is liable to be followed by the most serious consequences, both as it respects the health and the happiness of the individual. At first, the emissions are strictly voluntary; they take place under the influence of a lascivious dream, or an excited state of the brain, and are attended by the usual feeling. By and by, however, as the local irritation increases, they occur without sensation, and without consciousness, either during sleep, or while the patient is at the water-closet. When the habit is fully established, there may be five or six discharges a week, or even as many as two or three in the twenty-four hours. The disease may continue in this state for years, without any decided abatement. The seminal fluid itself, although secreted in preternatural quantity, is without ropiness, very thin, and characterized by a strong odor.

It is hardly to be expected that an affection which keeps up such a constant drain upon the system, should continue long without seriously disturbing the general health. Among the earlier symptoms denotive of this circumstance, are, derangement of the digestive organs, attended with constipation of the bowels, occasional headache, and nervous tremors. At a more advanced period, the patient is harassed with palpitation and dizziness, his sleep is disturbed at night, his extremities are cold, his body exhales a peculiar seminal odor, he shuns society, and he becomes a prey to gloom and despondency. The erections are imperfect, the testes waste, and there is a feeling of numbness and coldness in the thighs, scrotum, and perineum. Impotence, more or less complete, is one of the most common effects of this disorder in protracted cases. When the disease is fully established, the patient labors under loss of memory, his actions are those of a poltroon, he has no longer any faculty for business, and he is unable to look any one in the face. In a word, he is mentally and physically emasculated. Epilepsy and insanity may also be mentioned as occasional consequences of this vile practice.

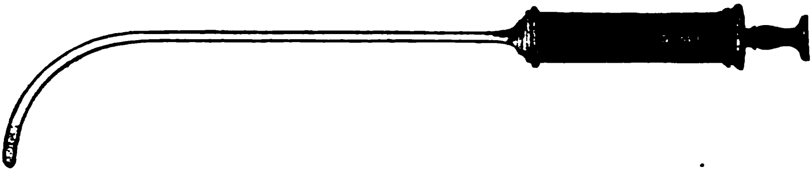
The *diagnosis* of spermatorrhœa is generally very easy. In fact, the only affection with which it is liable to be mistaken, is a discharge of mucus from the urethra and prostate gland, especially when it occurs at the water-closet from severe straining in defecation, or during strong sexual excitement. Under such circumstances, it is not uncommon for a few spermatozoa to be mixed with the mucus, but the number is too small to constitute the disease. Nor must the occasional presence of spermatozoa in the urine be looked upon as, in itself, an evidence of seminal disorder, inasmuch as bodies of this kind are not unfrequently seen in this fluid in young and middle-aged persons in perfect health.

The *treatment* should be commenced as early as possible; for the longer it is deferred the more danger will there be of permanent impotence and wretchedness. The milder cases, after riddance of the exciting cause, often get well spontaneously, or under the use of very mild means, as a proper regulation of the diet and bowels, exercise in the open air, cold bathing, and sleeping upon a hard mattress. When the parts are morbidly sensitive, leeches may be applied to the perineum, and recourse be had to some astringent and anodyne injection, as a solution of acetate of lead and opium, in the proportion of three grains of each to the ounce of water, used twice a day. But a very different mode of management will be required when the disease is fully established, especially when it is dependent upon habitual onanism. The best local remedy, then, is cauterization; without this, in fact, nothing can be done with a prospect of a radical cure. Before resorting to the caustic, the urethra should be well explored with a bougie, or silver catheter, to ascertain the precise seat of the irritation. This will sometimes be found in front of the membranous portion of the urethra, but, in general, it is farther back, at the neck of the bladder, or, more properly speaking, at the orifices of the ejaculatory ducts and the anterior extremity of the gallinaginous crest, and is often so great that the patient shrinks from the mere contact of the instrument. Occasionally the morbid sensibility is diffused over the whole surface of the urethra, from one end to the other, and then the passage of the bougie is liable to be followed by excessive pain and even syncope. When the seat of the irritation has been ascertained, the caustic—a bit of nitrate of silver, inserted in the instrument sketched at page 760—is to be conveyed down to the requisite distance, and held there from five to ten seconds, when it is cautiously withdrawn, the object being merely an antiphlogistic one. Carried beyond this, the remedy becomes a cause of abuse, likely to be followed by harm instead of benefit.

When the cauterization is finished, the patient is requested to drink a tumblerful or two of gum water, with a small quantity of spirit of nitric ether, and to observe the antiphlogistic regimen. If the pain is considerable, or if strangury supervene, a drachm of camphorated tincture of opium, or half a grain of morphia, may be taken. The operation should usually be repeated once a week until there is reason to believe that the morbid sensibility of the part is entirely destroyed. The number of applications must, of course, vary in different cases, but, in general, from two to five will suffice.

Instead of the solid nitrate of silver, a solution of this salt may be employed, in the proportion of ten to sixty grains to the ounce, although the effect is, I think, less certain. The fluid is conveyed to the seat of the disease by means of a syringe such as that represented in fig. 609, shaped like an ordinary catheter, perforated with numerous foramina at the distal extremity, and constructed upon the same principles as the common syringe. The injection should not be repeated oftener than once in six, eight, or ten days, and the result will be more satisfactory if the patient previously empties his bladder.

Fig. 609.



Syringe-catheter.

Cold bathing, general and local, is often highly beneficial. Sitting in a tub, and dashing the cold water against the perineum, scrotum, penis, and inside of the thighs is useful. Some persons, especially such as are of a nervous, irritable temperament, experience greater advantage from warm bathing than from cold. Occasionally marked relief arises from cold enemata, repeated twice in the twenty-four hours. When the patient is plethoric, as is sometimes the case in the early stage of the disease, leeches may be applied to the perineum, followed, if the local excitement is unusually great, by a blister, a small seton, or an issue. When the morbid sensibility of the urethra is very extensive, obstinate, or persistent, the cauterization should be aided by the injection, twice a day, of a weak solution of nitrate of silver and opium. The proportions which I commonly employ are two grains of one and five of the other to the ounce of water. Sulphate of zinc, creasote, and acetate of lead, also answer extremely well in cases of this kind. The injection should be forced as far back as possible, and be retained two or three minutes in the canal, in order to afford thorough medication.

A total abandonment of masturbation, and temporary abstinence from sexual intercourse, are indispensable to a cure. Without this co-operation it is in vain to proceed with the treatment. The patient must sleep upon a hard mattress, and everything stimulating, whether in the form of food, drink, or medicine, must be carefully avoided. The bowels must be regulated by mild aperients, and on no account be allowed to become constipated. Exercise in the open air, either on foot or in a carriage, is an important auxiliary. Riding on horseback is to be interdicted, as it has a tendency to create undue excitement in the genital apparatus. Sometimes an entire change of occupation affords more relief than anything else.

When the patient, despite his utmost determination, finds it impossible to resist his bad habit, the whole skin of the penis should be frequently painted with tincture of iodine; or, this failing, vesicated with cantharidal collodion. Mr. Hilton, of London, states that he has successfully pursued this plan of treatment for the last twenty years, and I can bear testimony to its efficacy from personal observation.

When there is great prostration of the system, with restlessness and loss of sleep, tonics, such as quinine, and the aromatic tincture of the citrate of iron, with hyoscyamus or opium, are indicated. In such cases, a change of air, and the daily use of the shower-bath, greatly promote recovery. The diet should be light, but nutritious, and the patient should be allowed a glass of generous wine at dinner. Should there be reason to believe that the emissions are dependent upon cerebellar irritation, our chief reliance must be upon leeches and blisters to the nape of the neck, the cold shower-bath, and other soothing measures. Much has lately been written in favor of lupulin, as a sedative, in this disease; but, although I have frequently employed it, I do not think it has ever done any good in my hands. When such a remedy is required, the best article that I know of is bromide of potassium, given three times a day, in doses varying from eight to ten grains, in union with five drops of tincture of aconite, and half an ounce of camphor water.

When, by the above measures, the system has regained its natural tone, and the sexual apparatus its accustomed vigor, the best guarantee against relapse will be marriage. Upon this point, however, the practitioner cannot be too much upon his guard.

The practice of onanism often engenders a want of confidence in young men, in regard to their ability to consummate the marriage contract. In fact, it renders them sometimes temporarily impotent. I have repeatedly known this to be the case after the marriage had taken place, much to the annoyance both of the patient and the surgeon. In general, however, the defect is rather in the mind than in the body, and may easily be corrected by entire abstinence for several weeks, and by the use of a little medicine, such, for instance, as a few drops, three times daily, of equal parts of tincture of nux vomica, chloride of iron, and cantharides, with the assurance of speedy recovery. In this way confidence is restored, and the difficulty, of course, soon vanishes. Occasionally the obstacle is caused by too great an eagerness on the part of the individual, or by too frequent indulgence soon after marriage. At other times, again, the erections are imperfect, or the act is prevented by a premature emission. These effects frequently subside of their own accord; when they do not, an attempt should be made to correct them by a judicious course of treatment, especially the use of tonics, the shower-bath, galvanism, and attention to the bowels and secretions, aided, if the parts are morbidly sensitive, by cauterization of the urethra, and mildly astringent injections.

CHAPTER XIX.

DISEASES AND INJURIES OF THE FEMALE GENITAL ORGANS.

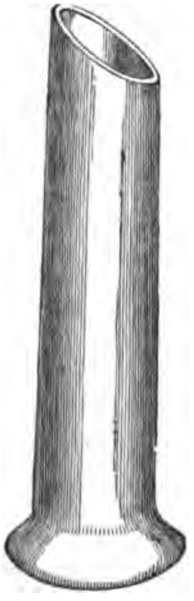
SECT. I.—AFFECTIONS OF THE UTERUS.

THE uterus is liable to displacement, inflammation, hypertrophy, various kinds of tumors, and carcinoma. Before I proceed to describe these affections, it will be necessary to offer some remarks respecting the proper mode of ascertaining their existence; or, in other words, the most suitable manner of examining a woman when she is supposed to be laboring under disease of this organ.

When the object is to determine the position of the womb, the exploration should be made with the finger, well oiled, and introduced into the vagina, as the woman is standing up before the surgeon, who supports himself upon his knee, or sits on a low stool. In this manner, the finger, moved about in different directions, readily detects any displacement, whether it affects its neck, body, or fundus. If the patient coughs while in this posture, the effect produced by the concussion of the diaphragm and abdominal muscles upon the dislocated viscus is easily appreciated, at the same time that any change in its bulk may be ascertained by the touch, as this variety of exploration is called, and also the extent and degree of the morbid sensibility that may exist. The examination will always be more satisfactory if the bowels are previously well opened. Very frequently important information may be acquired by the introduction of the finger into the rectum. Retroversion of the uterus, ovarian dropsy, and various pelvic tumors, are often better diagnosticated in this way than in any other.

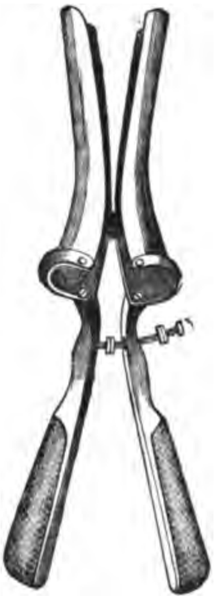
When the design is to inspect the mouth and neck of the uterus, or this organ and the vagina, the patient is placed upon her back, across the bed, her feet resting upon its edge, where the breech should also be, the limbs being raised and widely separated from each other. A sheet, with a small hole in the centre, is thrown over the person, which must never be exposed in any case. Some practitioners prefer that the patient should lie on her side, close to the edge of the bed, with the limbs well flexed upon the pelvis, and the body somewhat doubled up. Whatever posture be adopted, it is highly important that there should be a clear light, and it need hardly be added that that of the sun is superior to an artificial one. The index and middle fingers of the left hand are placed against the orifice of the vagina, near its superior extremity, when the speculum, properly warmed and oiled, is gently and slowly passed along the tube as high up as the mouth of the uterus, which, if not too large, often projects directly into it, thus affording a complete view of its condition. The speculum which I have long been in the habit of using is the cylindrical, fig. 610, about six inches in length, and of a slightly conical shape, to facilitate its introduction. In order to meet the various contingencies that arise in practice, several such instruments, of progressively increasing size, should be at hand. The valvular speculum, represented in fig. 611, although generally objectionable, because it admits of the

Fig. 610.



Cylindrical speculum.

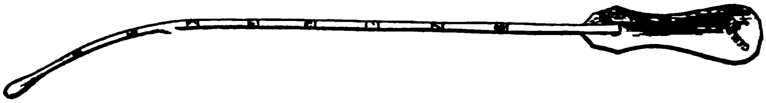
Fig. 611.



Bivalve speculum.

intrusion of the mucous membrane of the vagina, may advantageously be used in certain displacements of the uterus, especially in retroversion. Professor Miller, of Kentucky, prefers a cylindrical speculum, bevelled at each extremity, in opposite directions, so as to shorten one of its sides, which is turned towards the pubes, during the introduction; an arrangement which, it is alleged, not only admits more light, but affords easier access to the mouth of the organ. Occasionally the examination may be conducted with great advantage with a Sims's duck-bill speculum. Whatever instrument is used, a proper probe should always be at hand. For ordinary purposes, none answers better than the one delineated at p. 376; but when the object is to explore the cavity of the uterus, or to replace this organ, Simpson's sound, fig. 612, should be selected, or that recommended by Dr. Miller, which is a good deal more curved than that of the Scotch obstetrician, and, therefore, better adapted to the rectification of some of the malpositions of the viscus. Another contrivance, that will be found of great service, is a soft sponge-mop, for wiping away the secretions, so as to afford a clearer view of the affected structures.

Fig. 612.

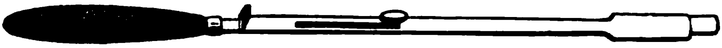


Simpson's sound.

When it is necessary to apply *leeches* to the uterus, or to the upper portion of the vagina, the object may readily be accomplished by placing the animals in the speculum, the parts having previously been well cleaned with water. The number of leeches to be used must vary according to the amount of the morbid action, and the condition of the general system. A good average is from three to five, which often cause a very copious flow, the bleeding frequently continuing for many hours after the animals have dropped off.

In congested, inflamed, ulcerated and enlarged conditions of the uterus, blood may often be advantageously drawn by *scarification*. The operation may be performed with an instrument expressly constructed for the purpose, as the one represented in fig. 613; or, what I usually prefer, an ordinary sharp-pointed bistoury, passed lightly over the affected surface at various portions of its extent. In hypertrophy of the neck of the organ, great and rapid relief frequently follows the use of punctures, the knife being thrust into the uterine tissues at numerous points to the depth of a line or more.

Fig. 613.



Uterine scarificator.

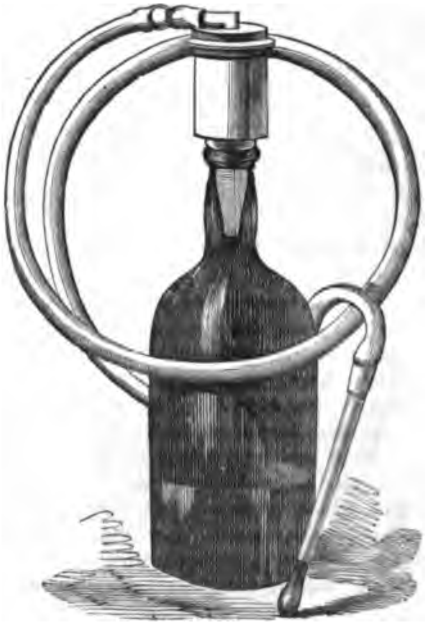
The most common *caustic*, or, rather, antiphlogistic applications that are made to the uterus are nitrate of silver, either in substance or solution, and acid nitrate of mercury, either pure or weakened. To insure efficiency to these applications, they should be made with the aid of the speculum, directly to the affected surface, care being taken not to use them too freely, too often, or too strong. The lightest possible touch frequently answers the purpose of an antiphlogistic agent. When the actual cautery is employed, a wooden speculum will be necessary, to protect the parts from the heat, and to prevent the fluids from coming in contact with the vagina.

Perfect cleanliness of the uterus and vagina, in disease, can only be secured by the use of the *syringe*, of which there are a great many before the profession; few, however, that combine all the necessary qualities of such an apparatus.

To answer the purpose properly, the instrument should be capable of holding at least from ten to twelve ounces; the nozzle should be long and curved, and perforated with numerous foramina, after the fashion of the common watering-spout. The injection may be administered by the patient herself, as she lies on her back, over a bed pan, or while she is sitting up, care being taken to use considerable force, in order to bring the fluid, which may either be simple or medicated, in contact with every portion of the affected surface.

Practitioners occasionally prescribe *anodyne injections* for the vagina, for the purpose of relieving pain of that canal and of the uterus; but, unless the operation is performed while the pelvis is thoroughly elevated, the fluid soon runs off, and no benefit is received. Besides, the proceeding is both awkward and inconvenient. I have, therefore, myself long since abandoned it, and used, instead of it, cotton or lint, rolled up into a ball, steeped in a strong solution of morphia, or pure laudanum, and introduced by means of the finger in immediate contact with the mouth of the uterus. A great variety of substances, anodyne, astringent, and detergent, may be used in this way, to the infinite comfort of the patient.

Fig. 614.



Apparatus for applying carbonic acid gas to the uterus.

Dr. Simpson has proposed, in cases of severe uterine suffering, the application of sedatives, in the form of carbonic acid gas and of the vapor of chloroform, by means of an ordinary wine-bottle, furnished with a gum-elastic tube, about three feet in length, surmounted with an ivory nozzle. The cork is perforated, and has a metallic box, containing a piece of sponge, affixed to its top. The whole contrivance is represented in fig. 614. For forming carbonic acid gas all that is necessary is a tablespoonful of crystallized tartaric acid with an equal quantity of crystallized bicarbonate of soda in about six ounces of water. To this mixture from an eighth to a fourth of an ounce of chloroform may be added if it is desired to produce a stronger sedative influence. As soon as the evolution of the gas in the vagina has commenced, the patient perceives a rush and a slight feeling of heat, which are gradually followed by a soothing effect and a temporary relief of pain.

Besides its anæsthetic properties, Dr. Simpson believes that carbonic acid is one of the best local curative applications that can be made to an ulcer, and in proof of this assertion he refers to the results of his own practice and to the experience of Dr. Ewart, of Bath, who, in the last century, employed the article with excellent effect in two cases of open cancer of the breast, one of which, it is said, healed completely under its influence, while the other was greatly relieved by it. The remedy should be used with great caution, as it is not devoid of danger.

The surgeon is sometimes obliged to remove a *pessary* from the vagina, owing to the pain, inflammation, ulceration, and discharge which it so often provokes. The operation is by no means always an easy one, especially if the instrument is globular and of large size, when it may be exceedingly troublesome and embarrassing. The ordinary ring, flat, or horse-shoe pessary may usually be extracted with the finger. When unusual difficulty is experienced, recourse may be had to the lithotomy-forceps; and a similar expedient will often be necessary in retention of the globular pessary. Cases have been witnessed where the suffering from attempts at extraction was so intense as to call imperatively for the use of chloroform.

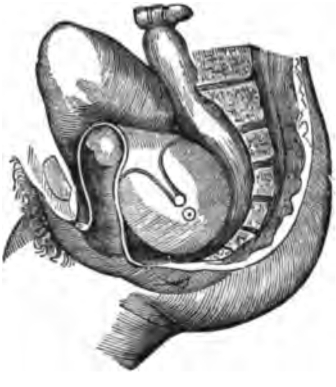
It seems difficult to understand why practitioners should still be so fond of the pessary, when it is so often productive of mischief, and when the very principles upon which its use is founded are so erroneous. I am sure that no one who has ever witnessed the happy effects of a well-constructed abdominal supporter would exchange such an apparatus for the most unexceptionable pessary that could be devised. The one is clean and comfortable, the other filthy and painful; the one takes the weight of the viscera off the uterus, and enables the female to walk and exercise without inconvenience, the other, without supporting the uterus, compresses the vagina, bladder, and rectum, and renders progression often difficult, if not impossible.

MALPOSITIONS.

Of the various malpositions to which the uterus is liable, the most common are retroversion, anteversion, prolapse, and inversion.

1. In *retroversion*, fig. 615, the orifice of the uterus is tilted up against the pubic symphysis, the fundus being thrown downwards and backwards, so as to form a tumor between the vagina and the rectum. Thus the axis of the organ is totally reversed relatively to its natural situation within the pelvis. The displacement is very common in the unimpregnated state, and is also occasionally met with during pregnancy, especially between the third and fourth months. It generally occurs in consequence of the relaxation of the ligaments of the uterus, and of the engorged condition of this organ, rendering it, as it were, top-heavy, and thus favoring its descent against the rectum. For these reasons, the accident is often met with soon after delivery, at a time when the body of the uterus is unusually large and vascular, and, therefore, incapable of sustaining itself in its natural position.

Fig. 615.



Retroversion of the uterus.

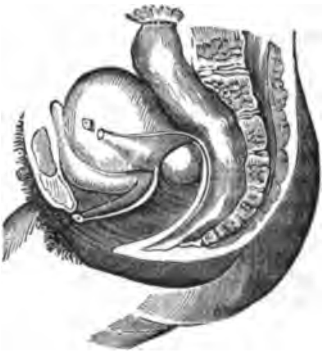
Retroversion of the womb is attended with a feeling of weight and dragging in the pelvis and groins, pain in the sacro-lumbar region, frequent desire to pass water, with almost constant uneasiness in the bladder, and difficulty in defecation. The general health is variously affected, and there is usually more or less leucorrhœa. In the worst forms of the disease, the patient often suffers from retention of urine. The retroverted organ is always easily detected with the finger, its orifice lying just behind the pubic symphysis, while the body forms a hard, globular mass, resting upon the lower part of the rectum. The affection is liable to be confounded with abscess of the pelvis, polyp of the uterus, ovarian tumors pressing down the posterior wall of the vagina, and stricture of the lower bowel.

The *treatment* must obviously be of an antiphlogistic character, consisting of rest in the recumbent posture, light diet, astringent and cooling injections into the vagina and rectum, and the application of leeches to the hypogastric and sacro-lumbar regions. If the woman is very plethoric, and the retroversion occurs soon after delivery, bleeding at the arm, followed by a brisk cathartic, will be useful. Under this management, the enlarged and engorged organ not unfrequently slips back into its natural position of its own accord. When there is much discharge, it may always be regarded as an evidence of inflammation of the uterus, or of the uterus and the vagina, and the case should, therefore, be treated accordingly.

Reposition is effected by the sound, carried into the cavity of the womb, and by pressure against the body and fundus of the viscus with the finger in the vagina or rectum. In the milder cases of displacement, the reduction may often readily be effected through the agency of the colpeurynter, carried high up into the vagina, and then forcibly distended with air or water. When the uterus has become firmly adherent to the surrounding parts, the disease may be regarded as irremediable, though considerable relief may follow the use of a pessary.

2. *Anteversion*, fig. 616, is a displacement precisely the reverse of the preceding, that is, the fundus of the womb is carried forwards on the urinary bladder, and the mouth backwards towards the rectum and the hollow of the sacrum. It rarely occurs during pregnancy, and is almost always associated with hypertrophy of the uterus. The anteversion is sometimes produced by morbid adhesions between the organ and the peritoneum, which have the effect of forcing it out of its normal position.

Fig. 616.



Anteversion of the uterus.

The *symptoms* of anteversion are often quite obscure, especially in the earlier stages of the complaint. Most women, however, thus affected, experience more or less distress, as a sense of weight and bearing down, in the pelvis, and dull, heavy, aching pains in the lower part of the back. Leucorrhœa also usually exists, and there is often marked disorder of the general health, as shown by various nervous and anomalous phenomena. The bladder is sometimes seriously incommoded by the pressure of the dislocated organ, and similar inconvenience is occasionally experienced by the rectum, though seldom to the same extent as in retroversion. The precise nature of the affection is always readily distinguished by digital examination.

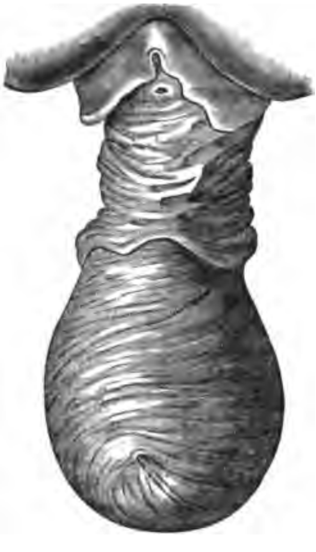
The *treatment* must be conducted upon the same general principles as in retroversion. If the dislocation depends upon engorgement of the uterine tissues, the remedies must be of an antiphlogistic character, conjoined with strict recumbency. Restoration is generally readily effected with the sound and finger, while counter-pressure is made upon the body and fundus of the uterus over the lower part of the hypogastrium.

In both of the above forms of displacement, the patient should observe recumbency for several weeks after the reduction, and, for a long time, pay great attention to her bowels and diet. Immediately after the operation is over, she should put on a uterine supporter, which should never be left off for a moment, when she is in the erect posture, until there is reason to believe that the parts have entirely regained their original functions.

3. The uterus is liable to *prolapse.* Notwithstanding that it has four ligaments which serve to maintain it in its natural position, it not unfrequently, both in its empty and gravid state, loses its hold and falls down into the vagina, or even beyond the vulva. In the latter case, the organ forms a tumor between the thighs, with a small, central aperture corresponding to its mouth, and the vagina is completely inverted, or pulled inside out. The accident is always attended with a thick muco-purulent discharge, a feeling of weight in the pelvis, dragging sensations in the groin and hypogastrium, pain in the sacro-lumbar region, and disorder of the general health. It may be produced by mere relaxation of the parts, with an engorged condition of the uterine tissues, but generally the immediate cause is a severe strain.

For the milder forms of prolapse, the most suitable *treatment* is the constant use of a well adjusted supporter, the pad, which should be rather broad, and of an ovoidal shape, resting upon the hypogastrium, so as to hold up the abdominal viscera, and thus prevent them from pressing too much upon the womb. The apparatus need not be worn at night, but it should always be put on in the morning before the patient gets out of bed. When the disease exists in a very aggravated degree, it may be necessary, in addition, to make the patient wear a stem-pessary, but such a contrivance should never be employed if it be possible to avoid it, as it often, of itself, becomes a source of great inconvenience, if not positive suffering, by inducing inflammation and even ulceration in the parts with which it lies in contact. In most cases, great benefit will accrue from the steady use of astringent injections, a soluble condition of the bowels, a concentrated diet, and rest in the recumbent posture, with the frequent application of leeches to the neck of the uterus. The ordinary pessary, of whatever shape or substance, is a filthy instrument, provoking pain and discharge, and generally productive of a great deal more harm than good. When the womb protrudes beyond the vulva, and the treatment here advised is ineffectual, the only resource is permanent closure of the greater portion of the vagina by suture of its opposed surfaces. The operation, known by the name of *episiorraphy*, has proved successful in a number of instances, and is quite free from danger. It consists in removing several longitudinal slips of mucous membrane, and in tacking the edges of the wound together with the needle and thread. When the case cannot be remedied in this wise, we may adopt the practice of Professor Geddings, and close the orifice of the vagina nearly entirely by paring the surfaces of the labia, and uniting them with the interrupted suture.

Fig. 617.



Inversion of the uterus.

4. In *inversion* of the uterus, the viscus is turned inside out. It is generally attended with more or less prolapse of the body of the organ, and seldom happens except during delivery of the after-birth, or the forcible removal of some tumor from its interior. Of this lesion there are three degrees. In the first, the fundus falls down nearly to the mouth of the womb, where it is arrested; in the second, it passes beyond this point for half or more of its length; in the third, the whole organ escapes at the inferior orifice. In the second case it is obvious that the body and fundus may be compressed, or strangulated, by contraction of the neck. The complete form of inversion of this organ is well shown in the annexed drawing, fig. 617, from a specimen in the possession of Professor Meigs.

The *treatment* must be prompt and decisive. In its milder forms, reduction, if attended to immediately after its occurrence, is occasionally effected without difficulty; but when the inversion is complete, especially if it has existed for some time, the operation is rarely, if ever, successful. The efforts at replacement will be more likely, other things being equal, to be successful, if the patient is perfectly anæsthetized. In performing the operation, the organ should be firmly grasped and equably compressed, so as to squeeze out its blood. Without relaxing his efforts, the surgeon then carries it up into the vagina, which will now become tense, and thus reinvert the mouth of the uterus, a most important element in the restorative process. The pressure being steadily continued, the body of the uterus becomes gradually shorter and shorter, the resistance at its neck progressively diminishing, until, eventually, the parts resume their natural position. For this method of treatment, which is as simple as it is ingenious, the profession is indebted to Professor Quackenbush, of Albany. He has himself succeeded with it in one case, and in the paper published by him on the subject he refers to two others, relieved by a similar procedure; one by Dr. J. P. White, of Buffalo, of fifteen years' standing, and the other by Dr. Tyler Smith, of London, of nearly equal duration.

In reflecting upon the nature of this affection, it has occurred to me that the reduction, especially in cases of long standing, might be greatly expedited by a slight vertical incision on each side of the neck of the tumor, where the chief cause of the difficulty is situated, the principle being the same as in the operation for paraphimosis.

When the tumor is hopelessly irreducible, it is not only a source of mechanical inconvenience, but of almost incessant hemorrhage, draining the system of blood, and keeping the woman constantly at death's door. Under such circumstances, as a dernier resort, amputation is occasionally practised. The operation, however, is generally fatal, the patient dying from shock, hemorrhage, peritonitis, or pyemia. In a case in my hands, some years ago, death occurred in less than forty-eight hours from inflammation, and in another in which I assisted Professor Miller, the woman perished from hemorrhage in less than three hours. From the results of these two cases, I should certainly have no desire to repeat the operation.

WOUNDS.

The unimpregnated uterus, from its small size and its concealed position in the pelvic cavity, is seldom the subject of wounds, but such accidents may readily happen in the gravid condition of this organ, especially after it has ascended above the pubes. The lesion is usually inflicted with a knife or sharp piece of wood, and several instances have been reported in which it was caused by the horn of an infuriated cow. Gunshot injuries of the uterus are uncommon. The Cæsarean section affords the best example of an incised wound of this organ.

It would be difficult, if not impossible, to diagnosticate a wound of this organ in its empty state, but such a lesion may, in general, be easily detected during pregnancy, by the escape of the amniotic liquor and the profuseness of the hemorrhage; besides, the accident might be attended by such an amount of injury of the walls of the abdomen as to afford an opportunity for direct inspection, as, for example, when a woman has been gored by a cow, or the pelvis has been ripped open by machinery or by the teeth of an animal.

The great sources of danger in wounds of the uterus are hemorrhage and peritonitis. The former, which may be immediate or secondary, may depend upon the injury sustained by the organ itself, or upon mischief inflicted upon the fœtus or the fœtus and placenta. In a case related by Devaux the woman speedily perished from copious hemorrhage caused by the knife having penetrated the child's chest. Death from peritonitis usually comes on at a period varying from three to five days. If it were not for these occurrences the probability is that few patients would die from such wounds, as they often readily unite by the first intention, as is shown in the Cæsarean operation.

In the *treatment* of wounds of the uterus the surgeon should be governed by the general principles of practice. If the organ has been penetrated, its contents should be removed either through the abnormal opening or by the natural route, after which the fluids in the pelvic cavity should be carefully sponged up, and the rent in the abdomen approximated by the interrupted suture, in the same manner as in wounds of the intestines. The opening in the uterus will promptly close of its own accord. The after-treatment must be strictly antiphlogistic; and the urine should be drawn off from time to time with the catheter.

INFLAMMATION AND ULCERATION.

The uterus is liable to inflammation, both in the married and in the single female, but much more frequently in the former than in the latter. The disease may attack any portion of the organ, or it may be limited to the lining membrane, the parenchymatous substance, or the peritoneal covering, or all these structures may be involved simultaneously, together with the venous and absorbent trunks.

Inflammation of the *lining membrane* is characterized by the same phenomena as inflammation of the mucous textures in other parts of the body. The redness, which is of a deep shade, is often spread over a large extent of surface, and may, in violent cases, be accompanied by small ecchymoses, with an escape of blood on pressure. The mucous follicles, especially those about the [illegible] uterus, are in a state of enlargement, and there is usually a very [illegible] crease of the natural secretion. In some instances, pus is [illegible] tinues to be discharged for a considerable period. An effusion of [illegible] is also sometimes observed, but chiefly when the disease invades the [illegible] organ.

Ulceration of the uterus may occur at any period after puberty [illegible] is most common between the ages of thirty and forty, in married [illegible] usually attacks the lips and neck of the organ, and exhibits every [illegible] from the slightest abrasion,merely involving the mucous lining, to a [illegible] lines in depth. The resulting sore may be of a circular, oval, or [illegible] In many cases it has the appearance of a crack, chap, or fissure, [illegible] dinally or obliquely upon the surface of the affected lip or neck. [illegible] sometimes very abrupt, giving the part an appearance as if a [illegible] been made into it with a punch. The bottom of the ulcer is [illegible] healthy pus, incrusted with lymph, or studded with granulations, of [illegible] color, and consistence. The surrounding structures are red, tender, [illegible] quite indurated. In cases of long standing, or unusual severity, the [illegible] tremity of the uterus is excessively engorged, considerably enlarged, [illegible] altered in its figure, often exhibiting a knobbed, clubbed, or pouting [illegible] In some cases, the affected structures, instead of being indurated, are [illegible] soft, or hard at one point and soft at another. In the more [illegible] of ulceration, the organ increases in its weight, and thus becomes a [illegible] own prolapse, by the dragging effects upon its ligaments.

The discharge which accompanies the ulcerative action is subject to the [illegible] possible variety, both as it respects its quality and quantity. Thus [illegible] thick and yellow, thin and sanious, bland or irritating, scanty or [illegible] from odor or more or less fetid. In general, it is mixed with [illegible] of a thick, ropy character.

Ulcers of the uterus may be acute or chronic, simple or specific. T[illegible] ulcer usually arises without any assignable cause, and often continues [illegible] and years, making, perhaps, in the meantime very little progress. The [illegible] ulcer is usually distinguished by its excavated character, its spreading [illegible] and the copper-colored appearance of the adjacent parts.

Inflammation and ulceration of the uterus often coexist with [illegible] *symptoms* are frequently vague and uncertain. The most important [illegible] are, a discharge of thick, yellow, purulent, or muco-purulent matter, a [illegible] weight and fulness in the lower part of the pelvis, tenderness on [illegible] hypogastrium, pain and aching in the sacro-lumbar region, and [illegible] ening sensations in the groins and back, especially during exercise. T[illegible] health, at first unaffected, is sure to suffer as the disease progresses. [illegible] strual function is apt to be disordered; and, although conception is not [illegible] even when there is considerable ulceration, yet a female thus affected is [illegible] liable to abort or miscarry. When the inflammation and ulceration are [illegible] standing, the uterus becomes enlarged, more or less engorged, and [illegible] various kinds of displacements. The diagnosis of the disease can only [illegible] factorily determined by a thorough exploration with the speculum.

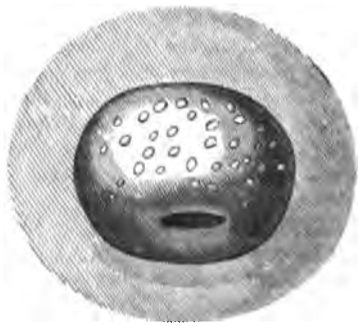
The *treatment* of inflammation of the mucous membrane of the [illegible] milder forms, is generally very simple, the disease usually promptly [illegible] the ordinary antiphlogistic remedies, as light diet, an active purge, [illegible] for a short time, and injections of acetate of lead, Goulard's extract [illegible] zinc. If the disease is obstinate, or complicated with ulceration, a few [illegible] may be necessary, followed by the application of the solid nitrate of [illegible] what I prefer, the dilute acid nitrate of mercury, repeated once a week, [illegible] being in the meantime daily syringed with cool or tepid water, medica[illegible] some astringent substance, as, for example, one of those just mentioned. [illegible] leeches cannot be obtained, recourse is had to scarification. If the [illegible] used too often or too freely, harm instead of benefit will result, and the [illegible] be much longer in getting well. The patient should be rigidly recumbent:

the treatment, the bowels should be maintained in a soluble condition by salts or magnesia, or cream of tartar and jalap, and the diet should be light and simple. Sexual intercourse is, of course, prohibited. If the inflammation extends into the cavity of the uterus, gentle cauterization will be required, followed, after the violence of the morbid action is subdued, by the use of medicated bougies.

A *granular* condition of the neck and mouth of the uterus occasionally exists, the mucous membrane being thickly studded with bodies similar to those which are so frequently found on the eyelids. The disease is generally a consequence of chronic inflammation, and is always attended with more or less muco-purulent discharge. The best local remedy is chromic acid, used in the same cautious manner as when applied to warty excrescences of the penis and vulva, repetition being effected every fourth or fifth day.

Another effect of chronic inflammation of the uterus is an extraordinary development of its *mucous follicles*. The disease is most conspicuous about the mouth and lips of the organ, where the glands are sometimes as large as a hempseed, or even a small pea, dense, almost gristly, and of a white, grayish color. The parts between them are generally tumid, red, morbidly sensitive, and disposed to bleed. Occasionally the enlarged glands are transformed into cysts of considerable size, filled with a pale, tremulous substance, easily removed by pressure. The appearance of these enlarged follicles, in the different stages of their progress, are well shown in fig. 618. The disease is always attended with induration and thickening of the neck and lips of the uterus and a tolerably profuse discharge of muco-purulent matter.

Fig. 618.



Follicular disease of the uterus.

The most effectual treatment is repeated and thorough scarification of the affected structures, along with leeching and the application of solid nitrate of silver; or, what I have generally found more beneficial, the pure tincture of iodine.

Inflammation of the *body* and serous covering of the uterus is most common in females during the first eight or ten days after parturition. It sometimes betrays an epidemic tendency, and rapidly passes into suppuration, softening, or even gangrene. The pus that is poured out, in such cases, may be situated in the parenchymatous structure, in the uterine cavity, the subserous cellular substance, between the folds of the broad ligaments, or, finally, in the venous and absorbent trunks, or simultaneously in all these parts. In most of these localities it occurs in the form of small yellowish-looking globules; but cases are observed in which it is collected into distinct abscesses, which are, however, never very large, and which manifest a disposition, sooner or later, to burst into the vagina, rectum, pelvis, or urinary bladder. The pus is generally blended with a good deal of lymph, and is sometimes highly offensive.

The lesion may originate in, and be limited to, the veins, constituting what is called uterine *phlebitis;* in the great majority of cases, however, the parenchymatous structure participates in the inflammation, assuming a dark, livid aspect, at the same time that it loses its natural consistence. Serum and pus may also be found in the subserous cellular tissue; while the peritoneal investment is sometimes covered with thick patches of lymph. The veins themselves are always much enlarged, and their cavities are filled with pus, clots of blood, or plugs of plasma. The disease often extends along the venous trunks of the pelvis to those of the abdomen, or even to those of the inferior extremities; and very frequently the absorbent vessels are similarly circumstanced, being greatly augmented in volume, and infiltrated with enormous quantities of purulent matter.

The *causes* of uterine phlebitis are not always very evident. In some cases it appears to result from violence done in the extraction of the placenta, while in others it may be traced to the effects of cold and moisture, irregularities of diet, or to some peculiar noxious condition of the atmosphere. In general, the disease exhibits all the evidences of erysipelas, or pyemia, both as it respects its pathology and symptoms. Ushered in by rigors, or chills alternating with flushes of heat, it soon assumes a typhoid character, the pulse becoming small and frequent, the tongue dry and parched, and the surface covered with profuse, clammy sweats. The abdomen is exquisitely tender on pressure, the stomach is irritable, the mind wanders, the milk is suppressed and the lochial discharge is excessively fetid.

The *treatment* must be conducted upon the same principles as in pyemia or erysipelas. Great attention is paid to cleanliness and ventilation; free use is made of the chlorides; the syringe is employed three or four times a day; leeches and fomentations are applied to the abdomen; the bowels are locked up with opium, to prevent irritation of the peritoneum; rapid, but gentle, ptyalism is aimed at; and support is afforded by quinine, iron, milk punch, and nutritious broths and soups.

HYPERTROPHY.

Hypertrophy of the uterus shows itself in two varieties of form, the general and the partial. In the first, the affection is usually most conspicuous in association with fibrous tumors, in which it is sometimes truly enormous. Thus, in a specimen in my possession, the walls of the organ are nearly two inches in thickness, and of a firm dense consistence, grating under the knife. Its cavity is of extraordinary size, and several small tumors are seen projecting from its outer surface. The hypertrophy is sometimes confined to the lips of the uterus, which, especially the anterior, become thick, dense, and stumpy. The immediate cause of hypertrophy of the uterus is, doubtless, in most cases, chronic inflammation attended with plastic deposits. The disease often continues for a long time without apparently any disposition either to advance or to recede. The diagnosis is readily ascertained by touch and inspection. If the organ is unusually large, it may be distinctly felt in the hypogastric region, and may occasion serious inconvenience by its weight and pressure. The affection must not be confounded with carcinoma.

The treatment of uterine hypertrophy must be conducted upon general antiphlogistic principles; by leeches, scarification, and cauterization of the neck and mouth of the organ, and by proper attention to the diet, bowels, and recumbency. The exhibition of mercury will be of no particular avail, except in so far as it may assist in improving the general health; but advantage will be derived from the internal use of iodide of potassium, and of hydrochlorate of ammonia, in doses of from five to ten grains, three times a day.

In *partial hypertrophy* the disease, affecting chiefly, if not exclusively, the neck of the organ, consists essentially in an elongation and thickening of its lips. The enlargement is attended with more or less induration, and usually presents itself as a conical body, not unlike the teat of a cow. The malady is evidently of an inflammatory origin, and, although both lips are commonly implicated, few cases occur in which they suffer in an equal degree.

The treatment of this variety of hypertrophy, in its earlier stages, consists of leeching, scarification, and cauterization with nitrate of silver, conjoined with recumbency and cooling injections. When the enlargement is of long standing, and of great bulk, the only effectual remedy is excision of the superfluous part, an operation not only easy of execution but perfectly safe.

ATROPHY.

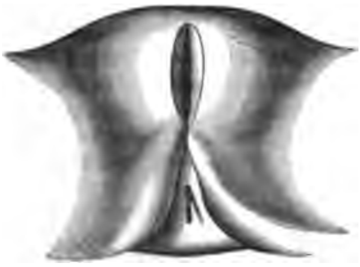
Atrophy of the uterus does not offer anything of special surgical interest. The affection may be purely senile, or it may be produced by protracted compression, as by the presence of a fibrous tumor situated in its own substance, an enlarged ovary, or an exostosis of the pelvic bones. When it exists in an unusual degree, it may be a cause of sterility.

Absence of the uterus is uncommon. It is generally associated with deficiency of the ovaries and Fallopian tubes, though cases occur in which the former of these organs are present, and fully developed.

STRICTURE AND OCCLUSION.

The mouth of the uterus is sometimes the seat of stricture, being preternaturally small, or so much contracted as scarcely to admit a silver probe, or even a hog's bristle. The lesion is often congenital, but in other cases it is brought about by inflammatory irritation, in the same manner as stricture of the urethra. A similar condition is sometimes observed in the cavity of the neck of the uterus. The canal, in one of my specimens, represented in fig. 619, is completely occluded, for the distance of nearly an inch, by the adhesion of its two walls. A stricture in either of these situations would be a cause of sterility and of painful menstruation, as well as of retention of the menstrual fluid.

Fig. 619.



Stricture of the uterus.

Stricture of the womb should be treated in the same manner as stricture of the urethra and other mucous outlets; that is, by a series of gradually enlarging metallic, gum-elastic, sponge, or elm bougies, aided, in obstinate cases, by incision with a slightly-curved urethrotome, or single lithotome. The case will generally require perseverance, especially if the contraction is very tight. The stem of the sea-tangle—the laminaria digitala of botanists—has lately been strongly recommended by Dr. Sloan and Dr. Wilson, as a substitute for the more ordinary tent, and from its property of expansion under the absorption of moisture, when introduced dry, is well worthy of further trials.

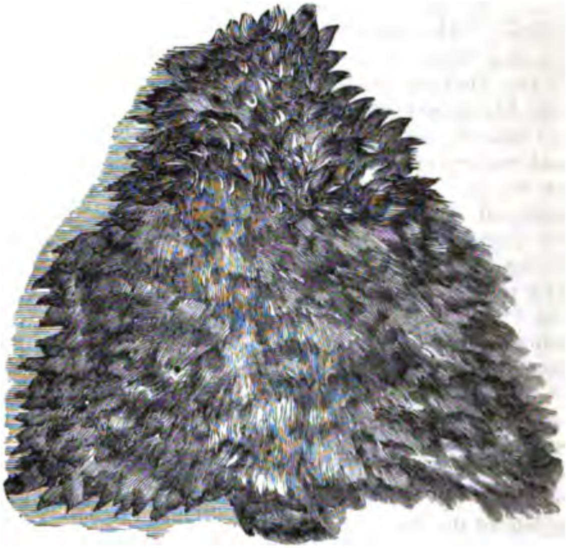
Occlusion of the mouth of the uterus is nearly always the result of inflammation, leading to an effusion of plastic matter gluing together the lips of the organ. The accident commonly occurs soon after delivery, and is sure to be eventually followed by retention of the menstrual fluid, causing the womb to expand in every direction, so as to form a large, globular, or ovoidal tumor, extending above the umbilicus, fluctuating distinctly under pressure, smooth on the surface, free from pain, and of a uniform consistence throughout. The general health usually remains for a long time nearly natural, though ultimately it is very apt to suffer. Severe uterine pains, of an expulsive and bearing-down character, are usually experienced at every return of the menstrual period. This circumstance, together with the absence of menstrual fluid, and the peculiar nature of the abdominal tumor, constitutes the most important and reliable diagnostic feature of the complaint.

The *treatment* consists in affording a free outlet to the pent-up fluid, which is generally of a grumous character, or partly fluid, and partly coagulated. Search is made for the natural site of the orifice of the uterus, but if this cannot be found, as near an approach to it is made as possible. The opening may be effected with a broad trocar, or, what is better, with a sharp-pointed bistoury. The contents of the tumor being evacuated, reclosure of the wound is prevented by the protracted use of the tent and bougie. I have by these means succeeded in effecting complete cures in four cases.

DYSMENORRHŒA.

Dysmenorrhœa, or painful menstruation, is a very common affection, both in single and in married women, but especially the former. It may depend upon various causes, as a narrow and constricted state of the uterus, the effects of cold, ovarian disease, and disorder of the general health. In many of the cases that have come under my observation, I have been led to believe that it was of a rheumatic character; a view supported by the presence of the atrocious lumbago which so generally attends it, and the relief afforded by anti-rheumatic remedies. However this may be, the disease is always of an inflammatory character, and is frequently, if not invariably, attended with a discharge of plastic matter and coagulated blood, the proper menstrual secretion itself being very sparing. The membranous concretion, fig. 620, which is seldom thick or firm, generally moulds itself to the inner surface of the uterus, and is sometimes expelled entire, though much more commonly in small pieces. The period required for the extrusion varies from a few hours to a number of days, and is always attended with much suffering.

Fig. 620.



Dysmenorrhœal membrane, as seen under water.

The *treatment* is palliative and radical. The first, which has reference to what should be done during the menstrual attack, consists in the free use of anodynes, as morphia, or laudanum, exhibited by the mouth, or, what is preferable, in the form of enema. In either case, from fifteen to twenty grains of camphor may be advantageously conjoined with the hypnotic. If the patient is plethoric, blood is taken from the arm, and the skin is relaxed by aconite or tartar emetic, and the hot foot-bath. The sacro-lumbar region is well rubbed, from time to time, with equal parts of strong ammoniated liniment and laudanum.

Believing that this disease is generally of a rheumatic, or rheumatico-neuralgic nature, I am satisfied that nothing will be found to be so effectual for its radical cure as the steady use of the wine of colchicum, in the dose of one drachm every night at bedtime, with half a grain of morphia, and ten drops of tincture of aconite, persevered in for several successive weeks. If plethora exists, blood may be taken from the arm, and the colchicum may be combined with the antimonial and saline mixture. The diet is properly regulated, the bowels are kept in a soluble state, and exposure to cold is carefully guarded against. Great relief will generally follow the application of a large opium plaster to the lower part of the spine, renewal being effected once a week. If the patient is anemic, the colchicum may, in a short time, be superseded by the use of quinine and iron, in union with strychnia and extract of aconite. When the disease is dependent upon an unusually tight orifice of the uterus, the treatment should be aided by the occasional passage of the bougie; but such an expedient will, I fancy, rarely be necessary.

NEURALGIA.

Neuralgia of the uterus is not uncommon, and is occasionally met with very soon after the age of puberty, especially in nervous girls, in connection with dysmenorrhœa. Married women, however, are most subject to it; and it is liable to occur both in the empty and the gravid state of the organ, though much more frequently in the former. Sometimes it takes place soon after delivery. Being generally associated with neuralgia in other parts of the body, it is either strictly periodical in its attacks, like the paroxysms of an intermittent fever, or, as is more commonly the case, it shows itself as a persistent affection, liable to frequent exacerbations. The exciting causes are not always appreciable, although usually it is dependent upon disordered menstruation, organic disease of the uterus, vagina, ovary, bladder, or rectum, or derangement of the digestive apparatus, or of the cerebro-spinal axis. In many instances it is directly traceable to the influence of malaria, and in that event its attacks are nearly always distinctly paroxysmal, recurring with considerable regularity once or twice a day, or once every other day.

The most prominent *symptoms* are sharp, darting or shooting pains in the uterus and pelvic region, extending into the limbs, the back, hip, groin, and abdomen, which, together with the uterus, is often exquisitely tender and sore on pressure. Not unfrequently the pain is of a dull, heavy, aching, gnawing, or burning nature. However this may be, it is always aggravated by fatigue, exposure to cold, disorder of the digestive organs, mental trouble and irregularity of the menses. In most cases it is attended with a bearing-down sensation, as if the organ were about to be expelled from the pelvis. I have repeatedly seen cases where the patient was unable, for weeks together, to maintain the erect posture, or even to walk across the floor, on account of the exquisite morbid sensibility of the affected structures.

In the *treatment* of this affection, which is often exceedingly obstinate, and even intractable, one of the first and most important objects is to remove, if possible, the exciting cause, when the pain will often disappear of its own accord. The diet, bowels, and secretions should claim special attention in every case. In the malarial form of the malady, quinine, either alone or in union with arsenic and strychnia, constitutes the most valuable remedy, and the same articles are frequently of great benefit in the more ordinary attacks. Colchicum, in drachm doses at bedtime, with half a grain of morphia, is also a remedy of much efficacy. During the violence of the paroxysm relief is sought by recumbency, the hot sitz-bath, hot fomentations to the abdomen and genitals, anodyne injections or suppositories, and morphia by the mouth.

COLLECTIONS OF GAS.

Air now and then collects within the cavity of this viscus, constituting the disease which has been described by pathologists under the name of emphysema, physometra, and tympanites. How the air is formed is still a disputed point. In many cases it may be distinctly traced to the decomposition of effused fluids, as blood, serum, or pus; in others, it is not unlikely that it is the product of a true secretion from the uterine vessels, brought about by some morbid condition, the precise nature of which is unknown. These accumulations may take place at any period of life, in married females, and are generally an evidence of previous conception. They may also occur in single women, as a result of organic disease. When considerable, they cause the womb to expand and rise up in the abdomen, as in pregnancy, with which it may easily be confounded. After the flatus has existed for several months, the uterus commonly makes an effort to dislodge it, expelling it with a noise somewhat similar to that occasioned in eructation.

The diagnosis is readily established by the peculiar elasticity and resonance of the tumor, the absence of fluctuation, and the occasional escape of flatus from the vagina.

The *treatment* consists in evacuating the air with the trocar, and in injecting afterwards some stimulating fluid, as a solution of nitrate of silver, iodine, or chlorinated soda, for the purpose of changing the condition of the mucous membrane of the uterus. If any putrid matter is present, it should, of course, be removed.

DROPSY.

Large quantities of water—ten, fifteen, and even twenty quarts—have been known to accumulate in the cavity of the womb, chiefly in young and middle-aged married women. The affection, however, is extremely rare, and is always connected with closure of the mouth of the organ, caused by previous inflammation, malignant disease, or some morbid growth. The fluid is generally clear and limpid like the serum of the blood, which it also resembles in its chemical properties. In some cases it is thick and turbid; it has also been found of the color and consistence of coffee grounds, probably from the admixture of sanguineous matter. The tumor thus formed often simulates pregnancy, is painful on pressure, and slightly fluctuates under the fingers. The disease, which is technically called *hydrometra*, is occasionally connected with utero-gestation, of which it then forms one of the most distressing complications. Its true pathology is still involved in obscurity. In all probability it is dependent upon chronic inflammation of the lining membrane of the womb, the character of which is changed into a kind of adventitious serous structure.

The disease, which is always slow in its progress, is characterized by the existence of a tumor, of a rounded shape, which, commencing low down in the pelvis, gradually ascends towards the umbilicus, occupying the middle line. It is soft and fluctuating, dull on percussion, of uniform consistence, and unaffected by position. Its identity with the uterus is easily established by vaginal examination, the neck of the organ being effaced, and the part distinctly fluctuating. When the uterus is not completely occluded, there is occasionally a partial escape of serous fluid. Menstruation is arrested, and the general health, although, perhaps, unaffected in the earlier stages of the disease, always seriously suffers in the end.

The only remedy for this complaint is tapping, the operation being performed at the natural site of the orifice of the uterus, or, if this cannot be found, at the most protuberant portion of the swelling. The fluid being evacuated, patency of the opening is maintained by the retention of the canula, or the use of the bougie. If reaccumulation occurs, the fluid is again evacuated, and an attempt should then be made to destroy the secreting surface of the organ by the injection of a small quantity of a weak solution of tincture of iodine. Tapping above the pubes, in this complaint, is objectionable, as it might be productive of fatal peritonitis.

HEMORRHAGE.

Of hemorrhage of the uterus I shall speak only as it affects the organ in the unimpregnated state. The occurrence is most common in married females, about the cessation of the menstrual function, and is observed in every state of constitution, in the strong and plethoric, as well as in the feeble and relaxed. A great variety of causes may give rise to it; but by far the most frequent is that peculiar state of the system which accompanies the disappearance of the menses, together with ulceration of the mouth of the womb, or the presence of some adventitious growth. Disease of the ovary also powerfully predisposes to this lesion; and there are some females who are naturally, or from habit, so prone to it that the most trifling exertion is sufficient to bring on an attack. The duration of the hemorrhage varies from a few days to several weeks. When dependent upon structural disease, or the presence of a polypous tumor, the blood often comes away suddenly, in a gush, which continues, at intervals, for a few hours, and then ceases.

Hemorrhage of the uterus, in the unimpregnated state, especially if it be chronic, should always induce a careful exploration of this organ, with a view to the ascertainment of the nature of the exciting cause, which, unless the woman has reached the change of life, will generally be found to depend upon the presence of some tumor, the removal of which promptly arrests the disease.

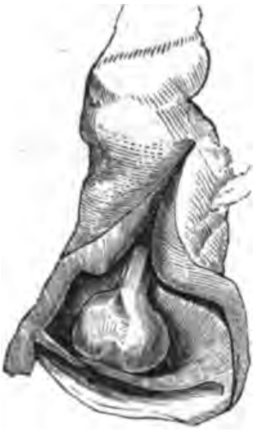
When the hemorrhage depends upon atony of the uterus, associated with an anemic state of the system, a course of chalybeate tonics, in union with quinine, and the cool shower-bath, is indicated. The bowels should be properly attended to, and the diet should be nourishing, but non-stimulant. The woman should keep her bed or lounge, as the erect posture never fails to aggravate the complaint. If the flow is at all active, acetate of lead and opium, or perchloride of iron, are employed, ice is applied to the hypogastric region, and strict recumbency is observed. If the organ is deficient in proper contractile power, ergot is freely administered. If a good deal of blood has already been lost, prompt recourse is had to the tampon, consisting of a mass of patent lint or raw cotton, a silk handkerchief, or a piece of sponge, wet with a strong solution of alum, or persulphate of iron, and carefully inserted into the vagina, in contact with the orifice of the womb, retention being aided by a large compress upon the vulva and a broad T bandage. The most unobjectionable plug of all is the colpeurynter, a gutta-percha bag, inserted into the vagina, and distended with air or water. If the ordinary materials are employed, substitution must be effected at least every forty-eight hours. In chronic uterine hemorrhage, a large blister to the sacro-lumbar region will often prove beneficial.

POLYPS.

There are, so far at least as my observation extends, not less than four varieties of uterine polyps, the fibrous, vascular, vesicular, and granular, of which the first is by far the most common.

The *fibrous* variety bears a strong resemblance to the fibrous tumor of the uterus, being of a fleshy consistence, firm, yet compressible, smooth, elastic, of a pale grayish color, and composed of dense filaments, which are so intimately interwoven with each other as to render it impossible to unravel them. In its shape it is commonly globular or pyriform; but now and then it resembles a mushroom, the rounded footstalk being attached to the neck of the uterus, and the base projecting into the vagina, as in fig. 621, from a specimen in my collection. The fibrous polyp has few vessels and nerves, and is, therefore, little liable to bleed or to be attended with pain. Tumors of this kind have often a very rough surface, and they sometimes contain considerable cavities filled with serum, jelly, pus, or earthy matter.

Fig. 621.



Fibrous polyp of the uterus.

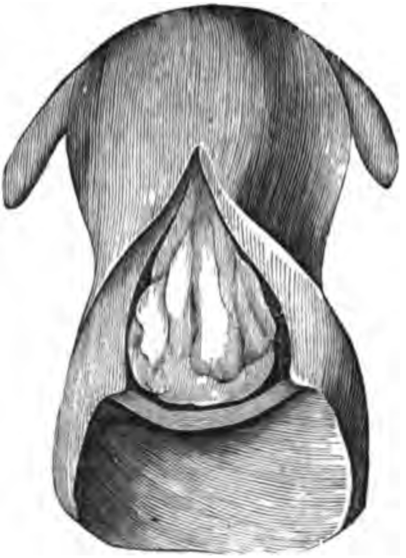
The *vascular* polyp is composed essentially of vessels and cellular tissue, the fibrous element being either entirely wanting, or existing only in a very limited degree. This species is extremely rare, and seldom attains a large size; it is of a red, florid color, of a soft, spongy consistence, sensitive on pressure, erectile, and exceedingly prone to hemorrhage. In respect to shape, it presents the same diversities as the other species.

The *vesicular*, cellular, or gelatinoid polyp holds a kind of intermediate rank between the two preceding, being softer than the fibrous and harder than the vascular. It is semi-transparent, of a peculiar grayish complexion, compressible, glistening on the surface, and attached by a delicate pedicle, which renders it pendulous. Carefully examined, it is found to exhibit a shreddy, tremulous structure, interspersed with a few vessels, which are generally too small to emit much blood. The gelatinoid polyp may acquire a large bulk, and is influenced by atmospheric vicissitudes, increasing in size when the weather is moist, and diminishing when it is dry.

The *granular* polyp consists in an enlargement of one or more of the mucous follicles, situated at the mouth of the womb, and described by the older writers under the name of the ovules of Naboth. It almost always occurs in clusters, of a whitish or grayish color, commonly about the size of currants or grapes, suspended by long, slender pedicles, and strongly resembling, in their general appearance, the surface of a cauliflower. When there is only one such tumor, it may attain the volume of a walnut, or of a hen's egg. It is invested by a smooth, delicate, vascular membrane, possesses little sensibility, and often contains a yellowish curdy matter, which is apparently nothing but inspissated mucus. Its connection with the uterus is very slight, and its growth generally very tardy.

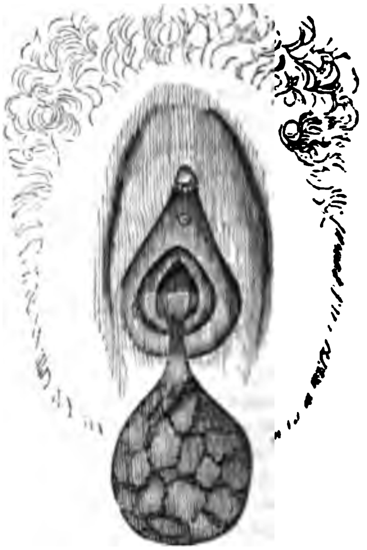
Uterine polyps are found of all sizes, from that of a bean up to that of a gourd. Fig. 622 represents a small tumor of this kind, of a pear-like, lobulated form, attached to the base of the cavity of the womb. Their volume, in some cases, is immense, ranging from ten to nearly forty pounds. They occasionally extend far down into the vagina; and cases have been witnessed in which they reached more than ten inches below the vulva, as seen in fig. 623. The shape of these morbid growths is mostly pear-like; and, although they may originate in any portion of the cavity of the uterus, they are most frequently attached to its neck. Many of them have a narrow, slender pedicle; and, in such as are of great size, it is not uncommon to see deep fissures, which give them a lobulated arrangement. They are all invested by a thin mucous membrane, which is more or less vascular, and merely a prolongation of that of the womb, immediately beneath which the morbid growth is developed. Large cavities, filled with various substances, are sometimes seen in them.

Fig. 622.



Uterine polyp attached to the base of the organ.

Fig. 623.



Uterine polyp hanging from the vulva.

Polyps of the uterus are most common in elderly women, especially such as have borne children. Their progress, which is usually very tardy, is characterized by vague, irregular pains, and by more or less hemorrhage, with a sense of weight and fulness in the pelvic region, vesical trouble, and a thin, sanious, fetid discharge. The menstrual function is either entirely arrested, or extremely irregular. The diagnosis can only be determined by a careful examination. If the tumor is of considerable bulk, it will be very apt, in time, to protrude at the vulva. Care must be taken not to confound a polyp of the womb with a recto-vaginal hernia, a prolapsed vagina or bladder, or an aborted ovum retained in the neck of the uterus.

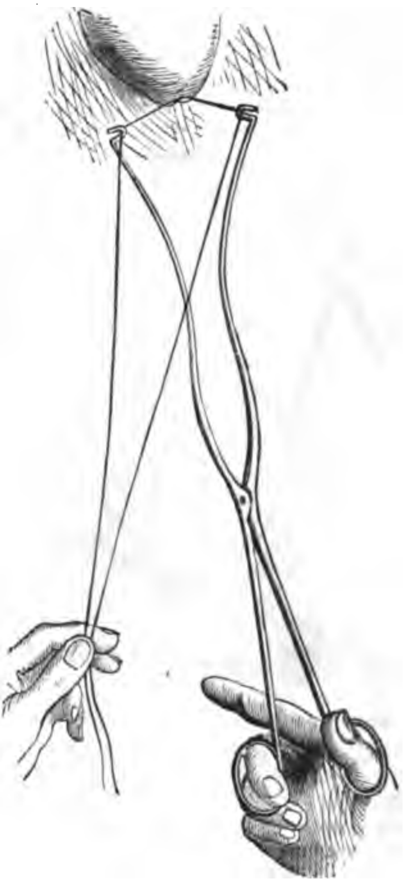
The termination of this disease is uncertain. In some cases, the patient lives in comparative comfort for years, while in others life is rapidly worn out by the constant hemorrhages that are so liable to attend it. I have seen nearly half a dozen women perish from this cause. Now and then, but very rarely, an instance of spontaneous expulsion occurs, followed by speedy recovery.

The only *treatment* that is of any avail in uterine polyp is removal, and the earlier this is effected the more likely will the woman be to make a good recovery. The operation may be performed by evulsion, ligation, or excision, precisely as in polpy of the nose. When the tumor is comparatively small, with a narrow pedicle, I always give the preference to the first of these methods, as being both safe, easy, and expeditious. The proper instrument is a large lithotomy-forceps, with rough, serrated blades, to insure a firm grasp. Or, instead of this, a Museux's forceps, or stout volsella, may be used. When the tumor is not too large, removal may be effected with the écraseur. The patient, during the operation, lies on the back, with the limbs elevated and well retracted; and care is taken not to cause undue displacement of the organ.

Ligation may be necessary when the tumor does not yield to evulsion, or when it has an unusually large base. The wire may be applied by means of a long double canula, and should be drawn with great firmness, so as to cause speedy strangulation. Great care is, of course, taken not to include any portion of the uterus.

Occasionally, the object may readily be effected with a stout, well-waxed ligature, passed round the tumor, and tied with the ingenious instrument of Dr. A. L. Carroll, delineated in fig. 624. The blunt hooks are at a right angle with the blades, which operate on the principle of a glove-stretcher, and the knots are secured almost with as much ease and rapidity, as when the parts are accessible to the fingers.

Fig. 624.



Dr. Carroll's knot tier.

Excision, by itself, is hardly proper in any case, the great objection to it being its liability to cause hemorrhage. The operation may occasionally be advantageously performed after the polyp has been partially or completely strangulated by the ligature, with a view to its more speedy riddance. The most suitable instrument is a long, probe-pointed bistoury, slightly curved towards the extremity, which is carefully insinuated around the neck of the tumor.

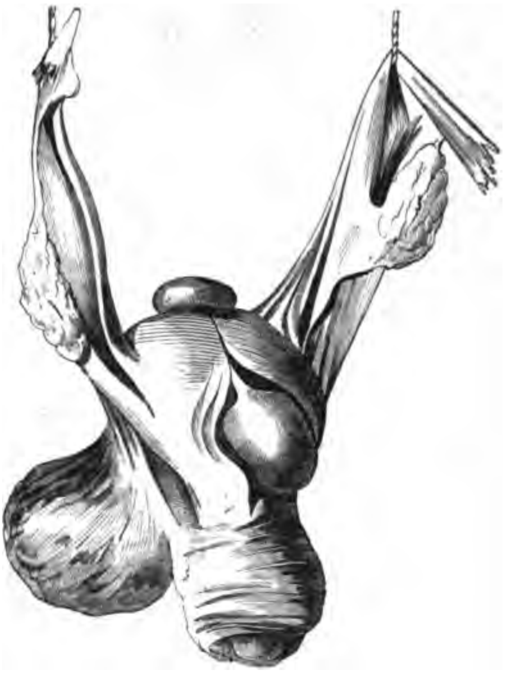
Most of the above procedures will be greatly facilitated by drawing the morbid growth previously down into the vagina, or even beyond the vulva, and separating it from the walls of the uterus by the interposition of sponge tents. Occasionally partial detachment may be brought about by the internal use of ergot, given for a few days before the operation.

Should hemorrhage follow these operations, it may usually be promptly checked by astringents, as powdered alum, or persulphate of iron, and a full anodyne, with ice to the hypogastrium. If these means fail, or the case is urgent, recourse is had to the tampon.

FIBROUS TUMORS.

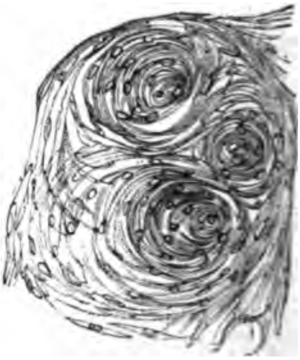
Fibrous tumors of the uterus are most common in elderly females, and they may occur either in its substance, in its cavity, or on its outer surface beneath the serous covering, or in all these situations, either simultaneously or successively, as in fig. 625. Their shape is usually spherical; their diameter from the size of a hickory-nut to that of a large melon; their weight from a few ounces to upwards of a hundred pounds, as in the remarkable cases reported by the late Dr. Francis, of New York; their structure firm, dense, opaqùe, and of a light grayish color, tearing into strong, concentric fibres. Such growths have sometimes a rough, granulated texture, and not unfrequently they contain small cavities, filled with earthy matter, serum, jelly, blood, or pus. In a fibrous tumor of the uterus observed by Cæsar Hawkins, there was a huge cyst which contained nearly two gallons of fluid. Similar examples have been described by Hewett, Schuh, and Lee.

Fig. 625.



Fibrous tumors of the uterus, both internal and external.

Fig. 626.



Section of fibrous tumor of the uterus.

The calcareous matter, which, in some instances, almost completely encases these morbid growths, in the form of a thin, brittle shell, not unlike that of an egg, consists chiefly of phosphate and carbonate of lime, together with a minute quantity of animal substance. The microscopical characters of the fibrous tumor of the uterus are exhibited in the annexed sketch, fig. 626.

Only one such tumor may exist in the uterus; or there may be a considerable number, perhaps as many as six, eight, ten, or a dozen. When large, they are usually irregularly lobulated, or divided by deep fissures; bloodvessels, often of considerable magnitude, may be traced into their substance. They manifest no disposition to ulcerate, to soften, or to become malignant.

When seated under the serous covering of the uterus, these tumors often hang by a very slender neck, and they then assume a pyriform shape. They possess very little sensibility; and, so long as they remain small, they produce no change in the form of the uterus, or any local inconvenience; but, when they attain a large bulk, they often incommode by their weight, and, by the pressure which they exert upon the bladder and the rectum, may seriously interfere with the expulsion of the urine and feces. When they are imbedded in the walls of the womb, or spring from its inner surface, the subjects of them are commonly barren; or, if they conceive, the uterine tissue is unable to undergo the necessary expansion, and abortion results. Sometimes these tumors are attached to the base of the womb, from which they ascend into the abdomen, where they may be moved about, and so simulate pregnancy, or ovarian disease.

A good idea of the situation, shape, and mode of attachment of the fibrous tumor of the uterus may be formed by a reference to fig. 626, from a preparation in Professor Meigs's collection.

The *diagnosis* of the fibrous growth of the uterus is uncertain, except when it occupies the cavity of the organ, and projects down into the vagina, or beyond the vulva, when a careful examination will generally serve at once to reveal its true character.

The affections with which it is most liable to be confounded are tumors of the ovaries, the Fallopian tubes, and the pelvic cavity. A careless observer might possibly mistake it for pregnancy, especially when, situated in the direction of the median line, it is of large size, rapid in its development, and of a rounded, convex shape. When the tumor is extra-mural, the neck and mouth of the uterus seldom undergo any material change, but the body is generally, if not invariably, more or less hypertrophied, and, as a necessary consequence, the canal is proportionately increased in length and diameter, the former often amounting to four, five, and even six inches. As no such alterations occur in ovarian disease, they constitute facts of great diagnostic value. When, on the contrary, the morbid growth occupies the cavity of the womb, the canal is either very much contracted, or totally obliterated, and the cervix is also eventually effaced, precisely as in the latter stages of pregnancy. In the mural variety of fibrous tumor there is commonly no morbid uterine discharge—not perhaps even any interruption in the menstrual function—whereas there always is when the tumor occupies the cavity of the organ.

When a fibrous tumor of the uterus is encysted, the distinction between it and an ovarian tumor must be very difficult, if not impracticable. The enlargement thus occasioned may be very great, and, if acccompanied by fluctuation, as it will be almost sure to be, could scarcely fail to lead to the suspicion of the existence of ovarian dropsy. The safest guide, in such an event, would be the condition of the mouth, neck, and canal of the uterus, which are seldom altered in ovarian disease but nearly always more or less in fibrous growths of the uterus.

The *treatment* of fibrous tumors of the uterus is very unsatisfactory. When the growth occupies the cavity of the organ, and has a pediculated attachment, removal may sometimes be readily effected by ligation or evulsion, as in an ordinary polyp. When, on the contrary, it is imbedded in the wall of the viscus, or connected with its outer surface, the case may be regarded as irremediable. An operation, it is true, has now and then been performed under such circumstances, but the result has not been such as, in my judgment, to encourage repetition.

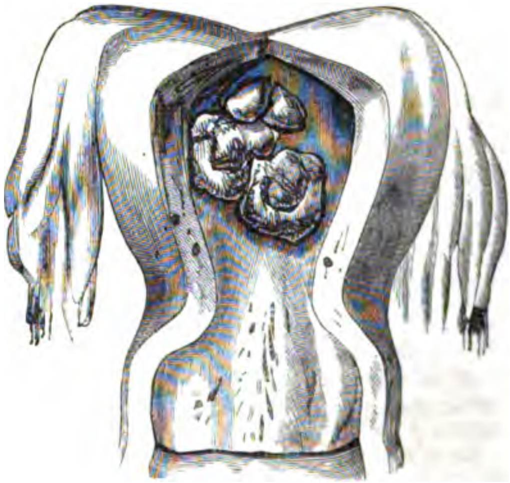
When the growth is situated in the uterine cavity, it is occasionally expelled, and the woman either recovers, or dies of the profuse hemorrhage that ensues.

CARCINOMA.

Cancer of the womb presents itself in two varieties of form, the scirrhous and the encephaloid, of which the first is by far the more common. Quite a number of diseases, apparently of the most heterogeneous character, but in reality very similar, if not identical, have been described by authors under the several denominations of scirrhus, fungus hematodes, cauliflower excrescences, corroding ulcer, and carcinoma. Scarcely any one of these appellations seems to me to be well chosen, as they have reference rather to certain states or appearances of the parts than to their true nature and constant anatomical characters. Not unfrequently, all the conditions expressed by these terms are blended together, and, even when they exist separately, they have invariably the same distinctive tendency.

Malignant disease, be its nature what it may, generally begins at the neck and lips of the organ, from which it gradually ascends to the other parts. So common is this mode of attack that it was once supposed to be invariable in its occurrence. Recent observation, however, has proved that there are numerous exceptions to this rule, the disease in many cases commencing at the base or body of the viscus, and thence spreading downwards towards its inferior extremity. The origin of cancer in the cavity of the organ is well shown in fig. 627, from a specimen in my collection.

Fig. 627.



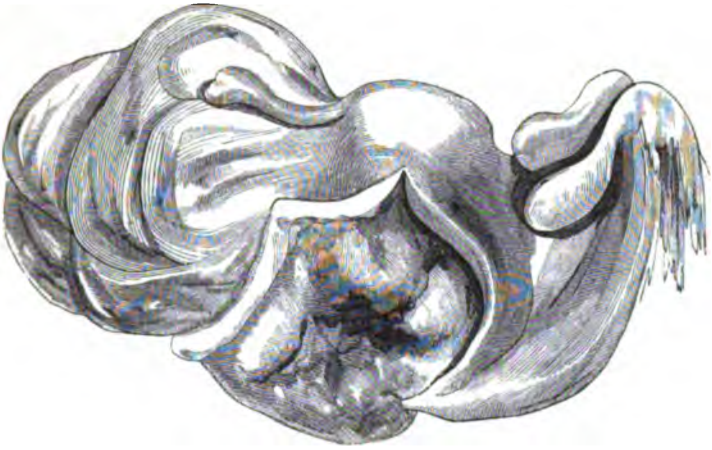
Incipient cancer beginning in the body of the uterus.

In *scirrhus*, the mouth of the womb is usually extremely hard, thick, and irregular, the lips being everted, painful on pressure, and apt to bleed on the slightest touch. After this state has continued for some time, ulceration takes place, a thin, sanious fluid, abundant in quantity, and highly irritating in quality, oozes from the vagina, and all the textures of the affected part are completely destroyed. The base and body of the uterus, which are often much enlarged, also change their appearance; they become hard and firm, like fibro-cartilage, and are intersected by dense, grayish, filaments, running in a radiating direction. The annexed cut, fig. 628, copied from a specimen in the possession of Professor Meigs, affords an excellent illustration of carcinoma of the uterus, beginning at the mouth and neck of the organ, and gradually extending upwards towards its body.

The *encephaloid* variety of the disease generally occurs in the form of soft, lobulated masses, the interior of which contains clots of fibrin, varying in color and consistence according to the length of time they have been deposited. Their size seldom exceeds that of an orange, but sometimes they are as large as a fœtal head, of an irregularly globular figure, and of a dark brownish complexion, caused by the secretion of melanotic matter. In other cases, again, though these are rare, the internal structure is of a deep red color, and composed essentially of anastomosing vessels, held together by cerebriform substance.

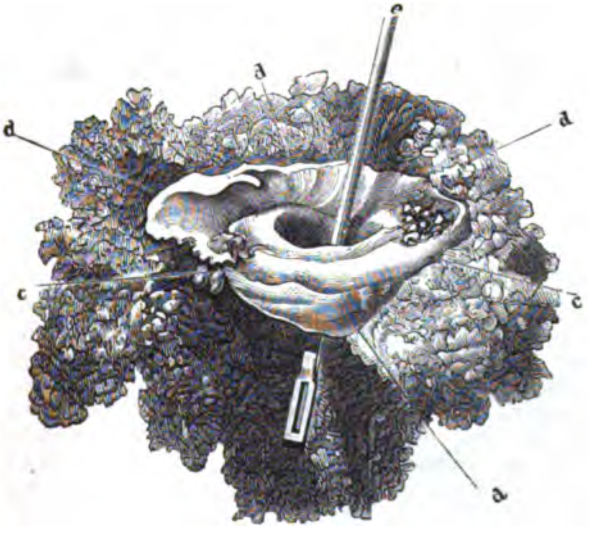
There is a form of carcinoma of the uterus, first accurately described by Dr. John Clark, of London, under the name of *cauliflower excrescence*, occasionally, though rarely, met with in this country. Its general features are well illustrated in the annexed cut, fig. 629, from Simpson. It is most common after the age of forty, springs invariably from the mouth and neck of the uterus, is rapid in its growth, and is always attended with a profuse watery or sero-sanguinolent discharge, highly fetid and exhausting. The morbid structure is of a soft, fungoid nature, rough, granulated, of a pale flesh color, very vascular, and prone to bleed on the slightest touch. As the mass increases it dilates the vagina, and sometimes protrudes at the vulva. Death finally occurs, after a period of from fifteen to eighteen months, from constitutional irritation, or from the effects of serous and hemorrhagic discharge.

Fig. 628.



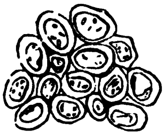
Carcinoma of the uterus beginning at the mouth and neck of the organ.

Fig. 629.



Cauliflower-excrescence of the posterior lip. *d.* Healthy anterior lip. *cc.* Base of anterior lip. *ddd.* Portion of healthy vaginal mucous membrane removed along with the cervix.

Fig. 630.



Epithelial cells from the same tumor.

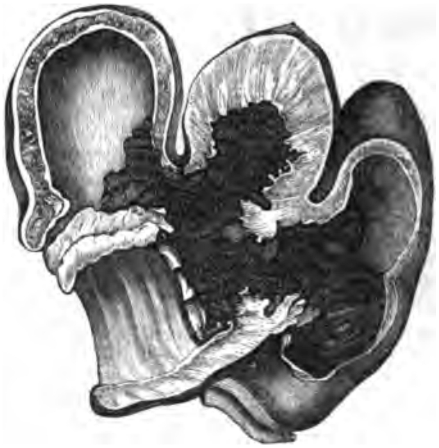
Of the precise nature of this disease we are still ignorant. In general it is undoubtedly highly malignant, but instances occur, although they are very rare, where the action would seem to be altogether of a benign character. In the case from which the engraving, fig. 629, was taken, the patient remained well at the end of eighteen years after the removal of the neck of the uterus by Dr. Simpson. She made a very rapid recovery, and became afterwards the mother of five children. A microscopical examination of the tumor, fig. 630, revealed an immense number of epithelial cells, but no caudate or spindle-shaped ones, as in the more malignant forms of uterine cancer.

As carcinoma of the womb, of whatever form, progresses, various morbid growths spring from the ulcerated surface, and fill up the vagina. These, at length, fall off by sloughing, and are either speedily succeeded by others, or they leave a deep, excavated sore, with hard irregular edges. In this stage of the complaint, there are generally copious discharges from the vagina, consisting of a thin, corroding sanies, serum, pus, or sero-purulent matter, almost insupportably offensive.

Scirrhus of the uterus is most common in married females that have borne children, soon after the decline of the menses. Mr. S. W. Sibley, of London, finds that of 135 women affected with cancer of the uterus, 123 had borne children, and 12 had not; making thus a difference of 86 per cent. Very few cases occur before forty and after sixty. Encephaloid, on the contrary, may take place at any period of life. Of 409 cases of cancer of this organ, examined by Boivin and Dugès, 95 are stated to have broken out before the thirtieth year, and the probability is that all, or nearly all, of these were examples of brain-like carcinoma.

The *symptoms* of cancer of the uterus are usually unmistakable even at an early period of its existence. One of its very first effects is hemorrhage, not slight, but severe, long continued, and recurring, with more or less frequency, throughout its entire progress, becoming gradually more and more profuse, especially in encephaloid. It is, therefore, a phenomenon of great diagnostic value, particularly in the inceptive stage of the affection. The pain is variable. In scirrhus it is usually sharp and lancinating, darting about through the neighboring parts, and coming on at an early period. In soft cancer, it is comparatively slight, especially prior to ulceration, after which it often becomes very severe. The general health seldom suffers much for several months; it then begins to decline, the patient losing her appetite, flesh, and strength, and the countenance ultimately assuming that peculiar, sallow, cadaverous aspect, so characteristic of the carcinomatous cachexia. The discharges are now also very profuse, and generally so excessively fetid as to be almost of themselves denotive of the nature of the malady. If, however, any doubt exist respecting the diagnosis, it will be promptly dispelled by a digital examination. In the earlier stages of the disease, the surgeon will do well to explore the parts both with the finger and the speculum.

Fig. 631



Carcinoma beginning in the neck of the uterus, and ending in the production of recto-vesico-vaginal fistule.

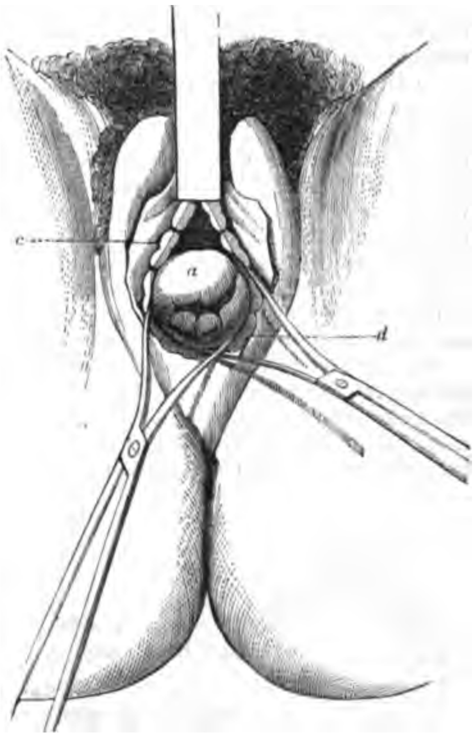
As the disease progresses, the morbid action gradually extends to the neighboring organs, as the vagina, rectum, and bladder, the two latter of which, as exhibited in fig. 631, are frequently laid open, thus adding greatly to the suffering of the poor patient. The body of the uterus usually retains its integrity longer than any other portion of the organ. After death, the pelvic viscera are generally found to be more or less matted together, and the lymphatic ganglions in a state of enlargement.

The period at which carcinoma of the uterus proves fatal, varies. Of 120 cases, reported by Dr. J. C. W. Lever, of London, 107 died at an average of twenty months and a quarter from the invasion of the malady. The shortest duration was three months ; the longest five years and a half. Marriage and the previous state of the health did not appear to have exercised any particular influence upon the progress of the disease.

The *treatment* of cancer of the womb is entirely palliative. Excision, it is true, has occasionally been advised, and even some very daring feats of this kind have been performed, always, however, eventuating fatally, either on the spot from shock or hemorrhage, or, at farthest, in a few months from a recurrence of the disease, or, what is more probable, from a want of thorough removal. The whole sum of the treatment with the honest and conscientious practitioner resolves itself into the adoption of measures calculated to assuage pain, arrest hemorrhage, promote cleanliness, and support strength. Recumbency will generally greatly contribute to comfort. When the morbid mass presents itself in the form of numerous excrescences, portions of it may often be advantageously destroyed with the actual cautery, introduced through a wooden speculum.

When the disease is strictly limited to the neck of the organ, and there are no contra-indications, as, for instance, the existence of cancer in other parts of the body, an operation may at least occasionally prolong life and prevent suffering. It is here more particularly that recourse might advantageously be had to the use of the écraseur, as being much more rapid in its work than the ligature, and less liable to be followed by hemorrhage than the knife. The manner of performing the operation may be easily understood by a reference to fig. 632, from Chassaignac.

Fig. 632.



Amputation of the neck of the uterus by means of the straight écraseur. *a*. Shows the neck of the organ dragged down to the vulva by means of Museux's forceps. *c*, *d*. The chain of the instrument passed round the part to its base.

HYSTEROTOMY, OR CÆSAREAN SECTION.

Various circumstances may arise to render it necessary to open the womb and extract the child, among which the more important are, deformity of the pelvis, rupture of the uterus and the escape of the child into the abdomen, and the sudden death of the mother from accident or disease. The mortality of the Cæsarean section has been variously estimated ; thus, some have placed it at 63 per cent., while others have asserted that upwards of two-thirds of those upon whom it is performed perish. Of 424 cases analyzed by a foreign writer, 210, or nearly one-half, died. Velpeau states that no successful example occurred in Paris during a period of forty years, and in Great Britain the result has been nearly equally unfortunate. Professor Gibson has succeeded twice in saving both mother and child, in the same patient. Dr. William Byrd Page and Dr. John Neill, of this city, have each had a case in which they saved the mother, but not the child, the cause demanding the operation being rupture of the uterus. In the North American Medico-Chirurgical Review for July, 1859, Dr. W. F. McClelland, of Iowa, has detailed the particulars of a case in which both lives were preserved.

Dr. Fleetwood Churchill has collected the particulars of 28 cases in which the Cæsarean section was performed more than once, with a result of 4 deaths, 3 having occurred after the second operation, and 1 after the third. In 20 of the cases the children perished. In one instance the operation was performed seven times, in another six times, and in a third five times, upon the same woman, with entire safety in each to the offspring.

When hysterotomy is necessary, no time must be lost in performing it; indecision and delay would inevitably be fatal. The bladder having been emptied, and the woman lying on her back with the uterus well supported on each side, an incision is carried through the integuments along the linea alba, commencing just above the pubes, and terminating near the umbilicus. The tendinous structure is then cautiously divided down to the peritoneum, which is next severed to the requisite extent with a probe-pointed bistoury. The wall of the uterus being now carefully incised, the exposed membranes are ruptured, either through the vagina, or otherwise, and the child and placenta extracted. Clearance of the pelvic cavity being effected, and any bleeding vessels secured, the abdominal wound is approximated by the twisted suture and adhesive plaster, and the case treated upon ordinary antiphlogistic principles, large doses of opium being given to control the bowels and prevent peritonitis, and special attention being paid to the temperature of the patient's apartment.

The dangers of this operation are, 1st, shock; 2dly, hemorrhage; 3dly, peritonitis; 4thly, metritis; and, lastly, pyemia. Of 147 fatal cases, analyzed by Dr. Charles West, 33 perished of shock, 13 of hemorrhage, and 56 of inflammation of the peritoneum, or of this membrane and of the uterus. When the patient survives the operation for a few days, she may sink under the effects of pyemia or erysipelas.

In regard to the hemorrhage that follows the Cæsarean section, it may be primitive or secondary—more generally the latter—and does not admit of relief. In some instances it proceeds from the incision being extended into the placenta; an accident which, as it may prove fatal in a few minutes, should always be carefully guarded against. The wound in the uterus is commonly very slow in healing, and has occasionally been found in a gangrenous condition after death.

SECT. II.—AFFECTIONS OF THE OVARY.

The most important diseases of the ovary, surgically considered, are inflammation and various kinds of tumors, both of an innocent and a malignant character.

INFLAMMATION.

Inflammation of this organ, technically called *ovaritis*, is probably a much more common disease than is generally imagined. It is most liable to occur after difficult parturition, provoked abortion, and suppression of the catamenia, in consequence of cold. In lying-in females it is generally complicated with inflammation of the uterus, Fallopian tubes, and pelvic veins, and, in all cases, it is extremely prone to extend to the peritoneum.

The *symptoms* of ovaritis are usually extremely obscure, a circumstance which readily accounts for the fact that the disease is so often overlooked. In general, the existence of the lesion may be inferred when there is excessive pain in the pelvic cavity, deep-seated, circumscribed, of a burning nature, and aggravated by pressure, motion, and the erect posture. As the inflammation spreads, the pain and tenderness become more diffused, and the patient generally lies with the limbs well retracted, to take off the tension from the abdominal muscles. High fever is always present; and, if the finger is introduced into the rectum, the ovary may often readily be detected by its large and globular feel.

When the disease passes into *suppuration*, the occurrence is denoted by rigors, alternating with flushes of heat, and accompanied by throbbing pains and an increased sense of weight in the pelvic cavity. If the quantity of pus be considerable, its existence may generally be discovered by a digital exploration of the lower bowel. The abscess may burst into the peritoneal cavity, causing fatal inflammation; or it may send its contents into the rectum, vagina, or bladder. Occasionally, again, especially when the inflammation is associated with disease of the uterus and Fallopian tubes, the abscess points in the groin, or in the ileo-inguinal region.

Large accumulations of pus, or sero-purulent fluid, occasionally form in chronic disease of the ovary. In a case of this kind, reported by Dr. Taylor, of this city, the quantity amounted to four gallons. The disease was of long standing, and the organ was converted into a large,.vascular sac, weighing seventeen pounds after the removal of its contents.

Ovaritis must almost necessarily be a dangerous disease, especially when it passes into suppuration, owing to its masked character, and its consequent liability to be overlooked at a time when *treatment* alone can be of much service in arresting its progress. The principal remedies, in the earlier stages of the disorder, are, venesection, especially if there is marked plethora; leeches to the hypogastrium and perineum, followed by fomentations; light diet; strict recumbency; and the use of aconite and morphia, with the neutral mixture. If there is much tenderness of the abdomen, a large blister should be applied. The lower bowel is maintained in an empty condition by enemata, but purgatives should be proscribed, as calculated to aggravate the disease. In ovaritis, consequent upon the puerperal state, the vagina should be frequently washed out with demulcent injections, medicated with liquid chlorinated soda.

If matter be detected, it may be evacuated through the posterior wall of the vagina, by means of a long, curved trocar, the canula of which may be retained for a few days, to insure patency of the puncture. If pointing occur in the groin or iliac region, the opening is, of course, made there, but not until there is reason to believe that the sac of the abscess has formed firm adhesions to the surrounding structures. In chronic abscess, the matter sometimes escapes spontaneously by the vagina, or through an aperture in the wall of the abdomen. Should artificial evacuation be demanded, it may easily be effected by a puncture through the linea alba.

TUMORS.

The principal innocent growths of this organ are the fibrous, cartilaginous, and encysted, the latter of which may be either single or multilocular. Of the malignant, by far the most common is the encephaloid; the colloid, melanotic, and scirrhous being very infrequent.

The purely *fibrous tumor* of the ovary is uncommon; in most cases it occurs in association with more or less cartilaginous matter and osseous concretions. Its density is, consequently, very great, so much so, as to bear a close resemblance to a mass of scirrhus, thus sometimes deceiving the unwary in regard to its real character. Occasionally cysts of considerable size, filled with various kinds of materials, are interspersed through its substance. In cases of long standing, the fibrous tissue is sometimes almost entirely replaced by the cartilaginous and osseous. The tumor is of a whitish, grayish, or drab color, irregularly lobulated, of slow growth, free from pain, or nearly so, and capable of attaining a large bulk, often weighing many pounds, and greatly incommoding by its pressure.

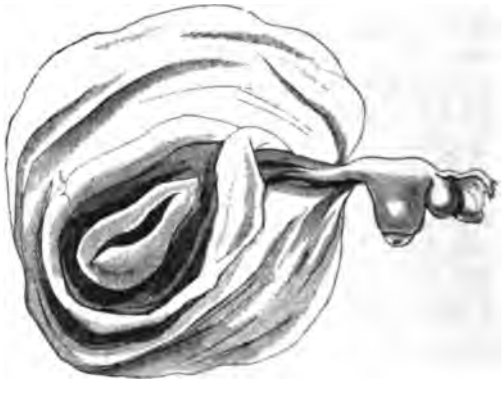
The *unilocular cyst*, or the simple encysted tumor of the ovary, is, as the name implies, a single bag, consisting essentially of the peritoneal and albugineous tunics of the organ, greatly thickened by interstitial deposits, and occupied by serous fluid, of a pale straw color, viscid in its consistence, and composed of a large portion of albumen, as is shown by the fact that it is nearly all converted into a solid mass on the application of heat. Its quantity varies in different cases, and under different circumstances, from a few ounces to a number of gallons, as many as thirteen having been removed at a single operation. When the disease is of long standing, the fluid is often remarkably changed in its physical properties. Thus, it may be thick and ropy, like soft soap; green and tremulous, like jelley; or dark and thick, like molasses. The cyst is, at first, very thin, and, perhaps, almost translucent; but, as the disease progresses, it steadily augments in thickness and strength, and eventually acquires almost a leathery firmness. Under these circumstances, also, it generally forms adhesions to the surrounding parts, especially the walls of the abdomen, the bladder, uterus, omentum, and small intestine. Vessels of considerable size may be seen passing over its surface and dipping into its substance.

Of the *causes* of ovarian dropsy, properly so called, we are entirely ignorant; it is often, it is true, ascribed to external injury, as a blow or kick upon the abdomen, or violence sustained during parturition, but whether it is really ever produced in this way admits of doubt.

Hardly any *period of life*, after puberty, is perhaps entirely exempt from this disease, but experience has shown that it is most common between the twenty-fifth and fortieth years, or the period of the greatest activity of the sexual organs.

The annexed cut, fig. 633, represents a unilocular ovarian cyst of large size, from a preparation in my cabinet. The uterus is seen to retain its natural form and volume. Attached to its left horn, at the origin of the Fallopian tube, is a small, globular cyst, adherent by a short, slender pedicle, and entirely unconnected with the ovary on that side.

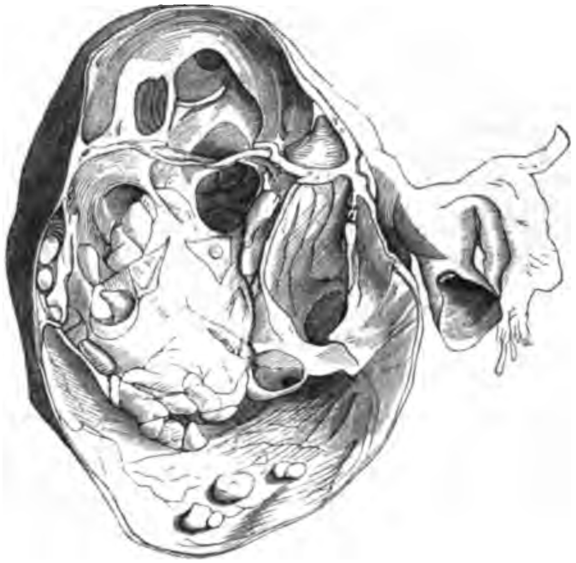
Fig. 633.



Unilocular ovarian cyst.

The *multilocular tumor*, or compound cystic growth, of the ovary, fig. 634, is composed of a congeries of cavities closely connected together, or developed, as it were, within each other, of variable size and shape; some being small, and others large, some round, and others ovoidal, or more or less irregular, and most of them occupied by different substances. The youngest generally contain a thin, serous fluid, whereas the older are filled with a thick, glutinous material, resembling jelly, soft soap, suet, honey, molasses, or a mixture of blood and starch. The larger cysts are often as big as an adult's head, and their walls are then frequently from three to six lines in thickness, very strong, and remarkably vascular. The multilocular tumor is usually of rapid development, and is capable of acquiring an enormous bulk, becoming early united to the surrounding parts, and seriously implicating the general health. Cases, however, occur in which its progress, at least for a time, is quite slow. Thus, in a middle-aged woman who was under my charge last summer, the disease was of nearly twenty years' duration.

Fig. 634.



Section of a multilocular ovarian tumor, showing secondary cysts on the walls of the largest primary cysts, and broken-down dissepiments between others.

The two forms of cysts here briefly described are sometimes associated; one part of the tumor being unilocular, the other multilocular. Again, instances occur in which they contain, as already intimated, various kinds of solid matter, as fibro-cartilage, cartilage, and bone. Sometimes they are occupied by hydatids, or acephalocysts, either attached to the inner surface of the sac by narrow, slender necks, or floating about in serum. An ovarian tumor occasionally contains teeth, hairs, and fœtal bones, either in separate cysts, or enveloped in a peculiar, saponaceous, fatty, or suety substance. These products now and then occur as a consequence of generation by inclusion; but generally they are the result of extra-uterine conception. Finally, cystic ovarian growths, whether simple or compound, are liable to take on inflammation, eventuating occasionally in suppuration, or in the formation of abscesses.

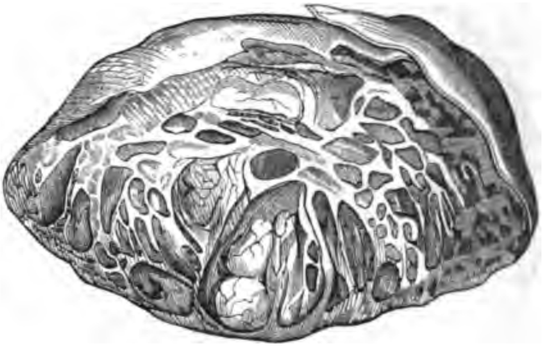
Malignant growths of the ovary are very rare. The most common is the encephaloid; the scirrhous, colloid, and melanotic being, as already stated, extremely infrequent.

Encephaloid may occur at any period of life, in girls as well as in married women, and usually runs its course with frightful rapidity. The brain-like matter, which distinguishes this disease, is generally found in small, irregular masses, inclosed in distinct cysts, of a fibrous texture. These masses sometimes attain a very great magnitude. They are usually of different shades of color, being of a pale olive, brownish, or mahogany in some places, white, cream-like, or grayish in others. Branches of vessels may often be traced, in great numbers, into their structure; and not unfrequently they contain large cysts, filled with serum, pus, or sanious fluid.

Scirrhus may occur by itself, constituting a hard, dense mass as large as a fist or even a child's head, of an irregular globular shape, of a whitish, grayish, or drab-colored aspect, and intersected by a great number of membranous filaments. The disease is most liable to show itself about the decline of the menses, and occasionally coexists with other morbid growths.

Colloid of the ovary, fig. 635, may occur alone, or it may coexist with other morbid products, particularly the fibrous and encephaloid; it is capable of attaining a large bulk, and exhibits the same structure as in other parts of the body.

Fig. 635.



Section of a colloid tumor of the ovary.

Melanosis of this organ is not only extremely rare, but probably never occurs without similar disease in other organs.

Ovarian dropsy and tumors of large size and of long standing are generally attended with remarkable changes in the walls of the abdomen. The muscles, from the great and constant pressure exerted upon them, become gradually remarkably attenuated, and ultimately almost completely deprived of their characteristic features. In a case under my care, not long ago, in an elderly lady who had suffered from enormous ovarian distension for upwards of thirty-five years, the abdominal muscles were reduced to mere fibrous membranes, perfectly white, and without any trace, apparently, of the natural structure. The diaphragm had undergone a similar transformation. When, on the contrary, the disease is of rapid formation, these parts experience no material alteration, and the abdomen may even be unusually loaded with fat.

The extent and degree of the internal adhesions are variable. Sometimes they are very slight, and, in recent cases, the tumor is not unfrequently entirely free. When, however, the disease is old, strong and extensive attachments may generally be looked for, not only to the walls of the abdomen but also to the viscera, especially the bowels and omentum, the latter of which may at the same time be remarkably hypertrophied and vascular.

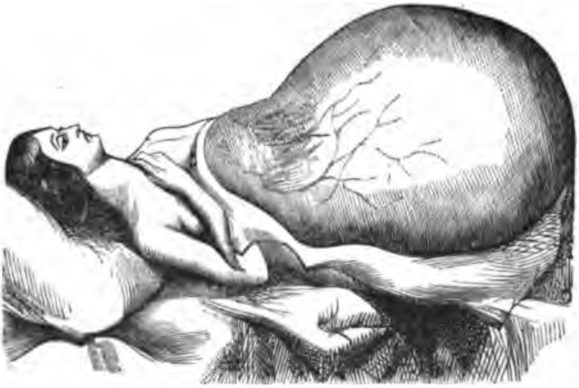
Finally, ovarian dropsy and tumors may be complicated with, or give rise to, various other affections, as hernia, especially of the umbilicus, hemorrhoids, and prolapse of the rectum, vagina, uterus, and even the bladder, as in a remarkable case under my charge a few years ago. Such occurrences, which are most liable to take place when the morbid growth is solid, or partly solid and partly fluid, and firmly adherent to the pelvic viscera, always add greatly to the patient's suffering. In the case just adverted to, the woman was so uncomfortable that she was hardly able to walk or sit, and was constantly annoyed with a desire to pass her water.

Diagnosis.—Tumors of the ovary, from whatever cause arising, are liable to be confounded with various other affections, of which the principal are, ascites, tumors of the uterus, pregnancy, and enlargement of the omentum, liver, spleen, and kidney. The greatest difficulty usually occurs when the morbid growth is of a solid nature.

From *ascites*, cystic tumors of the ovary are usually distinguishable by the following signs:—1. They are more tense, circumscribed, and protuberant. 2. They are situated more to one side, especially in the earlier stages of their progress, whereas in general dropsy the distension is equally diffused. 3. They are but little, if any, influenced by change of posture, while in ascites the fluid gravitates towards the lowest part of the abdomen when the patient sits up, and towards the posterior part when she lies down. 4. In ovarian dropsy the neck of the uterus is usually drawn up into the pelvis, perhaps almost beyond the reach of the finger; in peritoneal effusions, on the contrary, it occupies its accustomed situation, and may generally be easily pushed from one side to the other.

Important information is usually furnished by the state of the general health in the two affections. In ovarian dropsy, especially the unilocular variety, the health nearly always remains natural, or nearly so, for a long time; whereas in ascites it is commonly more or less seriously disturbed from the first, the disease which causes and accompanies it having firmly impressed itself upon the constitution before the effusion shows itself. To these circumstances it may be added that ovarian dropsy is usually very tardy in its progress, while ascites is ordinarily quite the reverse. When the disease is complicated with abdominal dropsy, the diagnosis may generally be promptly established by paracentesis. The ordinary situation of the cystic tumor of the ovary, behind the wall of the abdomen, is well shown in fig. 636.

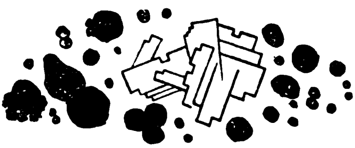
Fig. 636.



Ovarian cyst, the wall of the abdomen having been cut away.

Finally, valuable assistance may commonly be elicited by a microscopic inspection of the fluid after tapping. If the tumor be ovarian, there will always be, especially in old cases, an abundance of disintegrated blood globules, large granules, epithelial cells, oil cells, and crystals of cholesterine, as exhibited in fig. 637. In ordinary ascites, on the contrary, there is generally an absence of these bodies.

Fig. 637.



Microscopical characters of the fluid of an ovarian tumor.

Tumors of the *uterus* may be mistaken for ovarian, and conversely, as is proved by the fact that quite a number of operations have been undertaken for morbid growths that were supposed to be ovarian, but which turned out to be uterine. The diagnosis between the diseases of these two organs is by no means always easy. The enlargement of the uterus may depend upon a solid tumor in its cavity, its walls, or upon its outer surface, and the consequence may be that the organ is pushed to one side, thereby closely imitating the situation of an ovarian tumor, especially in its earlier stages, and rendering it quite impossible to discriminate between them. As the disease of the uterus advances, however, the effacement of the neck of the organ generally affords unmistakable evidence of the fact that the disease is not ovarian. In cases of doubt, the fundus of the uterus, if free from disease, may often be distinctly felt above the pubes, upon the introduction of the sound. A fluctuating tumor of the uterus is sometimes formed by the retention of the menstrual fluid; but its median situation, its globular figure, the absence of the catamenia, and the obliteration of the mouth of the organ, will afford a sufficient guarantee against any errors of diagnosis. Similar changes occur in dropsy of the uterus and in encysted fibrous tumors; while in physometra, or gaseous accumulations, the remarkable resonance accompanying the disease will always be characteristic. Finally, in ovarian disease, the uterus generally retains its natural shape and size.

Pregnancy has been mistaken for ovarian disease; such an accident, however, can hardly happen to a cautious, educated surgeon. The chief signs of distinction are, the history of the case, as the morning sickness and the absence of menstruation; the median situation and gradual development of the tumor; the changes in the breast and in the mouth and neck of the uterus; and, by and by, the discovery of the pulsations of the fœtal heart and of the placenta.

A sarcomatous enlargement of the *omentum* has been mistaken for an ovarian tumor. The patient, about to be operated upon, has suddenly died, and the dissection has revealed remarkable disease of the omentum, but none whatever of the ovary.

An enlarged *liver*, spleen, or kidney, or morbid formations connected with these organs, have occasionally led to errors of diagnosis, and several instances have been reported where, under such circumstances, the abdomen was laid open under the conviction that the morbid growth was a diseased ovary. The elevated and lateral situation of the enlargement or tumor; its gradual development from above downwards, instead of from below upwards, as in ovarian disease; the continuance of the menstrual function; and the natural position of the neck of the uterus, will generally suffice to prevent mistake. The history of the case will also serve to throw important light upon the diagnosis; for in organic maladies of the liver, spleen, and kidney there are always symptoms peculiar to the affections of each of these organs, and which, consequently, are wanting in ovarian tumors.

Finally, inordinate distension of the abdomen from the accumulation of gas and *fecal matter* has occasionally been mistaken for ovarian enlargement. Any doubt, however, arising from such an occurrence, may readily be dispelled by an efficient cathartic.

The diagnosis between *ovarian growths* themselves is not always so easy as might at first sight appear. The multilocular cyst is usually distinguishable from the unilocular by the greater rapidity of its growth; its more solid character, one part feeling hard and another soft; by a sense of greater weight and pressure; by the more early failure of the general health; and by the more marked enlargement of the subcutaneous veins of the abdomen.

The fibrous, cartilaginous, and other solid non-malignant tumors may generally be readily distinguished, at least in their early career, by their lateral situation, by their great firmness and mobility, by the tardiness of their progress, and by the want of disturbance of the general health, which frequently remains unaffected for years. Malignant ovarian tumors, on the other hand, are characterized by the rapidity of their progress, by their great bulk, by the severity of the local suffering, and by the inroads which they always make upon the constitution even at a very early period of their existence. In encephaloid growths the surface of the abdomen is generally knobby, or very irregular, being hard and firm at one point, doughy and semi-solid at another, and, perhaps, elastic and fluctuating at a third. The disease, in its latter stages, is always accompanied by great enlargement of the subcutaneous veins.

The presence of *adhesions* between the tumor and the surrounding parts may generally be inferred by the want of mobility of the morbid mass, as determined by the variation of the patient's posture, a careful digital examination, and the effects of a full inspiration, during which, if the tumor be non-adherent, it is sensibly depressed by the descent of the diaphragm.

Progress.—The progress of ovarian tumors is extremely variable. In the benign forms, it is often remarkably slow, causing hardly any suffering, either local or constitutional. Hence, the patient often lives in comparative comfort for years together, and may even bear children, though, in general, abortion takes place if pregnancy occurs, owing to the inability of the uterus to expand, so as to accommodate itself to the gradual growth of the child. In most cases, however, she suffers great inconvenience and annoyance, and ultimately dies exhausted, either from the drain upon her system, or from constitutional irritation. The multilocular tumor is always a more serious disease than the unilocular, or fibrous; while the encephaloid pursues a most rapid and unrelenting course, death usually occurring within from ten to fifteen months from the invasion of the malady.

In the simple encysted tumor, the sac is sometimes ruptured, either spontaneously, or accidentally; occasionally followed by a radical cure, especially when the tumor is small, but very frequently also by death. Thus, of 72 cases of this kind collected by Mr. Tilt, 32, or nearly one-half, perished from peritonitis.

When a spontaneous cure is effected, the water escapes through the Fallopian tube, vagina, bowel, bladder, umbilicus, or wall of the abdomen. In a case mentioned to me by Dr. Pepper, an enormous ovarian tumor, of many years' standing, emptied itself through the bladder. The lady, feeling a desire to relieve herself, filled in rapid succession six large chamber pots with fluid; the swelling immediately subsided, and a cure gradually followed. In another case reported to me by Dr. T. P. Gibbons, the water apparently escaped through the Fallopian tube. The woman, who was fifty-two years old, woke up suddenly one night, and found, to her surprise, her bed completely deluged with fluid. The tumor gradually decreased, but subsequently refilled, until it had attained a greater bulk than before. At the end of about twelve months, however, it again gave way, and the discharge now continued until all trace of the disease had disappeared. I have the notes of two cases in which the tumor emptied itself through the walls of the abdomen. In one the cure was permanent.

In a case of this disease, in a young lady of twenty-four, whom I saw with Dr. Joseph H. Wythes, the tumor had established a communication between the fundus of the bladder and the descending colon, eventuating in the formation of a stercoraceous fistule. After much suffering and annoyance, the opening in the abdomen finally closed, but death occurred three months subsequently from an attack of typhoid fever. On dissection, the ovarian cyst, of an oval shape, and about five inches in diameter, was found to be occupied by a large mass of sebaceous matter, intermixed with a large quantity of hair and two irregular pieces of bone, studded with well formed teeth.

TREATMENT

Medical treatment exerts but little, if any, direct influence upon the progress and termination of ovarian disease of any kind. A cure, it is true, has occasionally been effected in unilocular dropsy of this organ, but the occurrence is so extremely infrequent that it can only be regarded as an exception to a law whose general operation is opposed to such a result.

The remedies upon which the greatest reliance has hitherto been placed are the different preparations of iodine, as Lugol's solution and iodide of potassium, given in moderate doses, three times daily, and the ointment of iodide of lead, and the dilute tincture of iodine, applied freely to the tumid abdomen, at least twice in the twenty-four hours. Pressure has also been highly recommended, but, although I have frequently tried it, I do not know that it has ever afforded any good in my hands, and the same remark, in fact, is true of everything else that I have ever used in the way of general and local medication. Mercury, carried to gentle and persistent ptyalism, has been employed in numerous instances without any benefit.

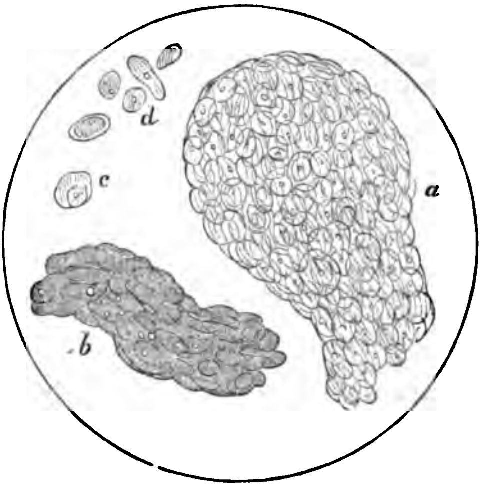
The treatment, as far as surgical interference goes, may be divided into palliative and radical; the former consisting of occasional tapping, to take off the weight and pressure of the fluid from the diaphragm and abdominal viscera; and the latter in the removal of the tumor, or, if it be encysted, in the injection of certain fluids, or the excision of a portion of its walls, with a view to the obliteration of its cavity.

Tapping.—Tapping of the unilocular form of ovarian dropsy is frequently required with a view to palliation; but it should not, as a general rule, be performed so long as the patient is comparatively comfortable, experience having shown that when it has once been done it will usually have to be done soon again. I am acquainted with an instance, in which the cyst, however, is combined with a solid tumor, where the operation has been performed upwards of sixty times in less than a year, the quantity of fluid removed at each operation being from four to eight quarts. The patient will usually be likely to get on best after tapping when the cyst is perfectly simple, or when it is associated with a stationary fibrous tumor of small size.

In a case upon which I operated for Professor Meigs, in October, 1856, paracentesis had been performed twenty-seven years previously, and yet the general health had all along been excellent. Twelve months after this the patient desired to be again tapped, but this I declined doing, and she bore her burden until the spring of 1860. The operation was repeated in May, 1862, thrice in 1863, and once in March, 1864. She died, completely exhausted, the following April, aged seventy-one. The quantity of fluid drawn off during this time was sixty-nine gallons, generally of a dark color, highly coagulable, and of the temperature of 98°. The sac, which was unilocular and extremely thin, with a very narrow pedicle, contained after death five gallons. The only inconvenience that this lady experienced during the seven years and a half of my attendance upon her was of a mechanical character, growing out of the immense size of the abdomen interfering with exercise, good looks, and, at times, with respiration. Her general health was usually most excellent. Altogether she lived upwards of thirty-four years from the time of the first operation.

One of the most remarkable features in this case was the existence of thousands of little buds or vegetations upon the inner surface of the sac, resembling very much the granulations of a healing ulcer of the skin. They were of a rounded or ovoidal figure, extremely vascular, and of a beautiful florid color. In size they varied from that of a clover seed to that of a large pin head. The microscopical appearances of these vegetations are well illustrated in fig. 638, from a drawing by Dr. Packard.

Fig. 638.



Granulations of an ovarian cyst. *a.* Papillary process of one of these bodies; *b*, part of a papilla undergoing fatty degeneration, the nuclei and cells becoming indistinct; *c*, a detached cell; *d*, detached nuclei.

In general, the water rapidly reaccumulates after tapping, despite all that can be done to prevent it. In most of the cases in which I have performed it, the tumor was nearly as large in three or four weeks, and sometimes even at the end of a fortnight, as at the time of the operation. In consequence of the steady drain thus established, the patient generally rapidly declines in flesh and strength, and ere long dies completely exhausted. Now and then, however, an extraordinary exception occurs. Thus, in the celebrated case of Martineau, paracentesis was performed eighty times in twenty-five years, the entire quantity of water removed being, in round numbers, eight hundred and twenty-nine gallons. The largest amount of fluid evacuated at any one operation was fifty-four quarts.

Temporary relief occasionally follows tapping in the multilocular variety of ovarian dropsy, even when the quantity of water that escapes is comparatively small.

The best point for performing the operation is the site of ordinary paracentesis; the patient is placed in a similar posture, with the same precaution as to the support of the abdomen, and the most suitable instrument is the common large, round trocar. When the tumor occupies the side of the abdomen, care must be taken to puncture it external to the course of the epigastric artery, otherwise this vessel might be wounded, and the patient die of hemorrhage. The operation may sometimes be advantageously performed at the umbilicus, which, when the tumor is large, and of long standing, often presents a pouting appearance, in consequence of the separation of the straight muscles. In a case under my observation not long ago, the patient, a highly respectable lady, was in the habit of tapping herself here with an ordinary thumb lancet whenever she suffered more than usual oppression. Sometimes, again, the puncture may be made through the posterior wall of the vagina, which, as stated elsewhere, is often sensibly protruded before the accumulated fluid.

When tapping is performed in the multilocular variety of dropsy, the puncture should be made in the most prominent and fluctuating part of the tumor. If one cyst does not yield the requisite supply, another is opened, an eye being always had to the situation of the epigastric artery.

When the operation is over, the abdomen should be firmly compressed by means of a thickly-folded cloth and a broad bandage, in the hope of preventing early reaccumulation. The effect should be steadily maintained for several weeks, and should be aided by attention to the diet, bowels, and urinary secretion.

Simple tapping is by no means always a safe operation. Of 117 cases reported by Kiwisch, Lee, and Velpeau, 16 perished during the first twenty-four hours; nearly as many within the first month; and a still greater number during the first year. I have myself never met with this accident, except in one instance, although I have performed the operation quite a number of times. But, even in that case, death was attributable, not to the operation, but to the imprudence and obstinacy of the patient; for, despite my most earnest remonstrance, she went home, a distance of upwards of one hundred miles, on the third day after she was tapped, and died a short time after from peritonitis.

Death has occasionally been produced by the perforation of a large venous trunk, ramifying on the surface of the cyst; and an instance has been related by Scanzoni, in which fatal hemorrhage was caused by the wound of a vessel of an adherent omentum.

Tapping has occasionally been combined with the permanent retention of the canula, in the hope that it might excite inflammation in the sac, and thus cause obliteration. Le Dran, who, in 1736, was the first to employ this procedure, has published two interesting cases of cure by it; and in modern times it has also occasionally succeeded, although in quite a number of instances it has proved fatal, either from peritonitis or constitutional irritation. Recamier and Kiwisch have proposed to perform the operation through the posterior wall of the vagina.

A cure has sometimes followed *excision* of a portion of the sac, drawn out through a small wound in the linea alba; the rest of the sac being either secured to the edges of the external opening, or permitted to sink into the pelvis. The procedure, however, is one of much hazard, as it is generally succeeded by violent inflammation and death. Nearly one-half of the cases that have been thus treated have perished, so that the operation is, perhaps, more fatal than even ovariotomy itself.

Injections.—Attempts at a radical cure by injections have occasionally been made. Some years ago, the operation was quite the fashion, and was only arrested by its want of success, or, rather, by its mortality, which was, on the whole, proportionately very large. Even in many of the cases that were reported as successful, the dropsy eventually returned, and soon attained its former height. The favorite article for injecting the sac was the tincture of iodine, sometimes pure, but more generally considerably diluted, and introduced in quantities varying from one to six or eight ounces, according to the size and age of the cyst. As might have been supposed, the operation was often followed by severe inflammation, leading to copious sero-sanguinolent effusion, and not unfrequently extending to the peritoneum. It must be evident that such a procedure is chiefly applicable to small and recent ovarian cysts, but even here we should hesitate a good while before resorting to it.

The only *statistics*, on a large scale, of this operation, are those furnished a few years ago by Velpeau, and it is not at all certain that they are reliable. They embrace 130 cases, of which 64 were cured, 30 died, and 36 were temporarily ameliorated. It is proper to add that, in 20 out of 30 patients who died, the injection was associated with the retention of the canula in the sac for a lengthened period, with a view of facilitating drainage; a procedure which no doubt considerably enhanced the danger of the operation. Boinet has reported 45 cases, in 34 of which the cyst was simple, and in 11 compound. Of the former 31 were cured, and 3 died, while of the latter there were 5 failures, and 6 deaths. In 4 cases treated in this way by Scanzoni, the result in every one was fatal, and the mortality in the hands of several other practitioners has been almost as great. Dr. Simpson, on the contrary, states that he has lost only 1 patient out of upwards of 40 after this operation. My conviction, nevertheless, is that iodine injections, however carefully performed, are fraught with danger, and that, although they may occasionally be productive of temporary benefit, they are seldom, if ever, followed by a permanent cure.

The injection may be performed with an ordinary gum-elastic bag, provided with a long narrow nozzle and a stop-cock, the contents of the sac having previously been thoroughly evacuated with a long trocar and canula. The quantity of fluid to be introduced must vary, according to the age and size of the tumor, from two to eight ounces, which may either be left in the sac, or, if productive of severe pain, be partly withdrawn. The officinal tincture of iodine, diluted with from two to eight parts of alcohol, is the most suitable preparation. The danger of the operation will be materially diminished if the injection be withheld until the second tapping, performed within a short time after the first, as this affords the sac an opportunity of shrinking. The abdomen should be well kneaded in order to bring the fluid in contact with every part of the sac, and care taken that no air is admitted. When the operation is over, the puncture is closed with adhesive plaster, supported by a large compress and a broad bandage. The after-treatment must be strictly antiphlogistic.

Ovariotomy.—Extirpation of the unilocular ovarian cyst has often been attempted; sometimes successfully, at other times with a fatal result, the precise ratio of mortality not having been determined by any reliable statistics. Such an operation, it appears to me, is only justifiable, as a general rule, in the event of rapid reaccumulation after tapping, attended with gradually increasing prostration, rendering it certain that the case, unless speedily relieved, must inevitably end fatally. Under such circumstances, no conscientious surgeon should hesitate to interfere; if the result is unfortunate, life is destroyed only a little sooner than it otherwise would be; if successful, the surgeon achieves a real triumph. In the more ordinary cases, the patient may be made comfortable by occasional tapping and attention to the general health.

When tapping is of no avail, and the case is steadily progressing from bad to worse, the tumor not only seriously interfering with respiration, but actually imperilling life, the only resource is extirpation; an operation whose merits, however, are far from being fully settled, notwithstanding the numerous instances in which it has been employed. That the operation has been wantonly performed, in the hope of acquiring temporary éclat, is unquestionable, and that much sacrifice of life has been the consequence is equally true. But this is an abuse of ovariotomy, not a right use of it, which it shares in common with every one of the great operations of surgery. Ignorance, stupidity, covetousness, and selfishness are peculiar to no pursuit. My opinion has always been that extirpation of the ovary is, under certain circumstances, not only justifiable, but imperatively necessary; and, I must confess, I have no sympathy with those who condemn this operation, and yet, almost in the same breath, approve of the removal of an ulcerated cancerous breast, or a jaw bone affected with encephaloid, in the hope, as is alleged, of enabling the poor patient to eke out a few short months of a miserable existence. Consistency is a virtue in surgery as it is in everything else.

The great difficulty in regard to ovariotomy consists, not in its performance, but in knowing when it is absolutely indicated. That there are cases of disease which do not admit of the use of the knife, all educated, honest, and reflecting surgeons are agreed. One of the great obstacles to success grows out of the difficulty, if not utter impossibility, in many cases, in arriving at a correct diagnosis, no matter what pains may be taken in the investigation. Hence, it is not surprising that in at least three-tenths of the cases that have been subjected to the knife, the operation had to be abandoned, while, in quite a number of others, no ovarian tumor of any kind was found. No man should be so fool-hardy as to operate in the dark, or at a venture, in the hope that the issue may be successful, when he has no positive assurance as to the character of the disease for the relief of which he is about to assail a human being. The following are the circumstances which, it seems to me, would render ovariotomy proper:—

1st. Simple cysts, attended with rapid reaccumulation after repeated tapping, and a regular, steady, downward tendency, rendering it probable that, if relief be not soon afforded, the disease will prove fatal.

2d. Multilocular cysts, steadily progressive, but without strong adhesions, and accompanied by gradual decline of health and strength.

3d. Solid tumors, of a non-malignant nature, whether fibrous, cartilaginous, or osseous; especially when they are rapidly increasing in size, or have already attained a large bulk, and are attended with ascites and more or less disorder of the general health; provided, of course, that there are no serious adhesions. In this category may be included those tumors of the ovary which are caused by extra-uterine fœtation and by conception by inclusion, particularly when there is reason to believe that the patient will perish unless assisted in this way.

On the other hand, I should consider an operation as unjustifiable, 1st, when the tumor, whatever may be its structure, is strongly and extensively adherent; 2dly, when the disease, from neglect, mismanagement, or other causes, has been productive of such a degree of exhaustion as to render it probable that the patient will not be able to bear the shock of the operation; 3dly, when the tumor is unequivocally of a malignant nature; and, 4thly, when it is impossible to arrive at a satisfactory diagnosis, especially after having made an exploratory incision.

No operation, of course, is proper when there is serious organic disease of other organs, as the heart, lungs, liver, or kidneys. The existence of albuminuria is a positive contra-indication to interference, and a similar rule is applicable to extreme depression of spirits. No operation should be undertaken during the prevalence of an epidemic.

Some preliminary treatment is generally proper, but this should not be carried too far, otherwise it may prove prejudicial. The secretions should always be carefully corrected; and, if the patient is debilitated, she should be subjected for at least a fortnight to the use of tonics, especially quinine and iron. Women in robust health do not bear the operation as well as those whose system has become accustomed to suffering, which thus establishes a certain degree of tolerance to the employment of the knife.

The operation of ovariotomy is of American origin, having been first performed in December, 1809, by Dr. Ephraim McDowell, of Kentucky. The patient, a married woman, the mother of several children, recovered without an untoward symptom, surviving the operation thirty-two years. The tumor, partly solid and partly fluid, weighed twenty-two pounds and a half. Until recently it was generally imagined that this operation had been devised and first practised in 1776 by L'Aumonier, of Rouen; but in my Report on Kentucky Surgery, presented to the Kentucky State Medical Society in 1852, I clearly showed that the case of the French surgeon was one simply of abscess of the ovary and the Fallopian tube, occurring in a prostitute consequent upon parturition. For the purpose of affording free vent to the purulent fluid, which had for some time escaped by the vagina, an incision, four inches in length, was made along the lower edge of the external oblique muscle, when, the diseased parts being separated from each other, the ovary was removed. The organ, which was encysted, was about the volume of an egg, and of great hardness.

It is believed that Dr. McDowell performed the operation of ovariotomy altogether about thirteen times. His first three cases were published in the seventh, and the last two in the ninth, volume of the Philadelphia Eclectic Repertory. Of these cases, three recovered, one perished of peritonitis, and the other remained well for nearly five years, when the tumor, which had been tapped, but which it was found impossible to extirpate on account of its firm adhesions, recommenced growing, and gradually regained its former bulk. In three other cases, of which I have collected the particulars, the operation, in one, was perfectly successful, while in the other two it had to be abandoned on account of the impossibility of detaching the morbid growth.

The operation, as now practised, is performed at the middle line of the abdomen, either by the long or short incision, as it is termed, the choice depending upon the nature of the case, especially the size of the tumor, and the presence or absence of adhesions. McDowell, in his first case, made his incision on the left side, some distance from the outer edge of the straight muscle, its length being nine inches. Subsequently, he cut through the linea alba, and this is the place now universally selected for the operation, the patient lying upon her back on a table, with the head and shoulders well elevated, and the feet resting on a high chair. The bowels and bladder are thoroughly emptied as a preliminary step. During the operation the patient is kept perfectly warm. The superficial incision, commencing just above the pubes, is made with an ordinary scalpel, and extends through the skin and cellular tissue. The linea alba is then pierced, when, a probe-pointed bistoury being inserted, the wound is enlarged to any extent that may be déemed necessary. In some instances it has been carried as high up as the xiphoid cartilage. No vessels are divided in this stage of the operation. The tumor, if perfectly loose, is now separated at its pedicle, previously surrounded with a stout, well-waxed ligature, drawn very tightly, and secured with three knots, when the ends are twisted together and brought out at the inferior angle of the wound. If the pedicle is very large, it will be well to pierce it with a needle armed with a double ligature, one of which is then tied on each side. Too much care cannot be taken in this respect, otherwise, the thread slipping off prematurely, the patient may perish from hemorrhage. Occasionally it becomes necessary to include the Fallopian tube in the ligature, owing to its intimate connection with the ovary. The separation of the pedicle is sometimes effected with the écraseur, the first operation of the kind having, I believe, been performed by Dr. W. L. Atlee. It does not always, however, afford complete immunity against hemorrhage; and for this reason the ligature should generally have the preference.

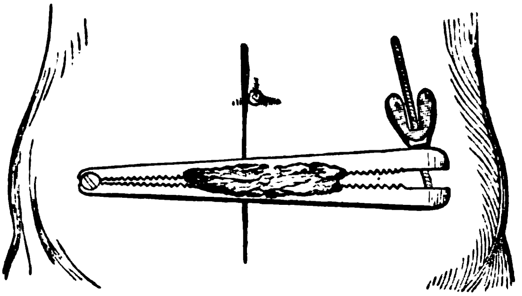
If the tumor is adherent, the attachments must be broken up with the fingers, the knife being used only when they are so strong as to refuse to yield in this way. The instrument, however, must be employed warily; chiefly, indeed, for the division of narrow, slender bands; for, if the adhesions are unusually firm and extensive, such a procedure would inevitably be followed by copious hemorrhage, and violent, if not destructive, peritonitis.

The operation may generally be greatly facilitated, especially if the tumor is unusually bulky, by letting out some of its contents, with the knife, or, what is preferable, a large trocar and canula, as may always easily be done when they are of a fluid character, care being taken that none escapes into the cavity of the abdomen. The bowels, during the dissection, should be carefully protected by an assistant, and, if necessary, kept warm with flannel wrung out of water.

The extirpation being completed, the bleeding arrested, and any fluid that may have fallen into the pelvic cavity removed with the sponge, the ligature attached to the pedicle is brought out at the lower angle of the wound, the edges of which are next to be approximated by numerous points of the twisted suture, the pins being carried close down to the peritoneum, in order that, in the event of recovery, the woman may afterwards not be the subject of hernia. Long adhesive strips should be stretched across the intervals of the pins, nearly round the abdomen, which should be still further supported with a compress and a bandage. To avoid irritation, Mr. Handyside, in 1846, carried the ligature through the recto-vaginal cul-de-sac into the vagina, and a similar procedure has since occasionally been pursued by other surgeons.

But the most approved mode of disposing of the pedicle is to dispense with the ligature altogether, and to bring it out at the bottom of the wound, fixing it there by means of a clamp, as originally suggested by Mr. Duffin. The instrument, as shown in fig. 639, consists of two parallel plates of steel, thinly gilded, jagged on the inner surface, and furnished with a screw at each extremity, so as to admit of firm, equable compression throughout. Care should be taken not to drag the uterus; and hence, if the pedicle is very short, it may be necessary to leave a little of the cyst, in order that the parts may be the more readily drawn out and secured by the clamp. Or, instead of using the clamp, the pedicle may be fastened above the pubes with the pins employed in uniting the lips of the wound, as adopted in a successful case of ovariotomy, in 1860, by Dr. Byford, of Chicago. Another valuable improvement in this operation, and one which greatly conduces to recovery, is the substitution of the metallic for silk ligatures.

Fig. 639.



Ovariotomy clamp.

The woman is now carried to bed, with her head and limbs elevated, to prevent tension of the abdomen, a jug filled with hot water is applied to the feet, and a full dose of morphia—by which I mean at least one grain—is given, for the triple purpose of allaying pain, inducing sleep, and insuring tranquillity of the bowels, which should not be disturbed for days together, except by an enema, in the event of unusual flatulence and colicky suffering. The anodyne is from time to time repeated; the diet should be bland, concentrated and nutritious; thirst is allayed with ice; the urine is drawn off at least thrice a day; and the temperature of the apartment is uniformly kept at about 80° of Fahrenheit, as well as thoroughly moist. Above all, care is taken that the patient is not exposed to draughts. As the great danger after this operation is peritonitis, everything should be done to ward of the attack. If serous, sanguinolent, purulent, or sero-purulent effusions occur, the lower extremity of the wound should be partially reopened, to admit of their easy escape, otherwise they may not only cause severe inflammation, but even pyemia. In general, indeed, the best plan will be to wash out the pelvic cavity several times a day with a tube and syringe charged with tepid water, slightly impregnated with chlorinated soda, or, what is preferable, a small quantity of permanganate of potassa. Such a procedure is often indispensable to recovery. Dr. Peaslee, who strongly insists upon its importance, and who ascribes the recovery of three of his cases to its employment, states that in one of his patients not less than 135 injections were used in eighty-four days. The pins should not be removed until there is firm union, and the parts should be well supported for a long time afterwards. The ligature is detached at a period varying from one to several months.

When both ovaries are diseased, they should be removed in immediate succession; an operation first performed by Dr. John L. Atlee, his case, which terminated successfully, having occurred in June, 1843. It has since been executed by Dr. Peaslee, and by several other surgeons.

Statistics.—The most extended and reliable statistics of ovariotomy are those of Dr. George H. Lyman, of Boston, published in 1856. They are founded upon an analysis of 300 cases, performed indiscriminately for vario diseases, including the one by L'Aumonier, undertaken for the relief of a of the ovary and Fallopian tube. Of these cases, the operation was by the removal of the tumor only in 208; in 78 it was found to be imprac in 10 it was performed partially; and in 4 the result has not transpir

Of 299 cases in which the result is declared, 179 recovered, and at the rate of a little over 40 per cent. Of the 208 cases in which the was completed, 119 recovered, and 89 died, or in the proportion of 100. Of the 78 cases in which extirpation could not be executed of the operation and 22 died, the result in one not being given. Of th in which the tumor was only partially removed, 5 recovered and 5 d

Of the 88 cases in which the operation could not be completed, the failure, in 68, were adhesions of the tumor; and of these 24 died. tumor could be found; and in the remainder it was either uterine, abdominal.

The incision, in 117 cases, was short; and of these, the operation pleted in 60, of which 37 recovered, and 23 died. Of the 57 cases in was abandoned or incomplete, 44 got well, and 13 perished. Of 143 the long incision, the operation was finished in 123, 72 recovering, and Of the 20 cases in which the extirpation was abandoned, or left incom escaped, and 9 were lost. The average age, in 221 cases, was 34.33 youngest patient being 17, and the oldest 68. Both ovaries were remove cases, of which 8 proved fatal.

The cause of death is given in 85 of the cases. Of these, 36 perished tonitis, 20 of hemorrhage, 12 of exhaustion, 2 of shock, 2 of pneumon of diarrhœa. The mortality was least between the ages of 50 and greatest under 20. The duration of the disease exercised considerable upon the result of the operation, recovery happening most frequently wh tumor had existed between three and four years. The difference in the m between the married and single was trivial. Finally, the danger of the op was greatly increased by the presence of uterine and other maladies.

The following table, which I have compiled from various sources, throw tional light upon the rate of mortality of this affection. The statistics in to the Kentucky, Ohio, and German cases, are given on the authority, r ively, of Dr. J. T. Bradford, Professor J. W. Hamilton, and Dr. Gustavus

Table of 422 Cases of Ovariotomy.

Operators.	Cases.	Recoveries.	Deaths.
Kentucky Surgeons	30	19	11
Ohio "	51	24	27
German "	64	12	46
C. Clay	108	74	34
S. Wells	100	66	34
J. T. Bradford	9	8	1
I. B. Brown	19	13	6
A. Dunlap	19	13	6
Tyler Smith	18	15	3
Total	418	244	168

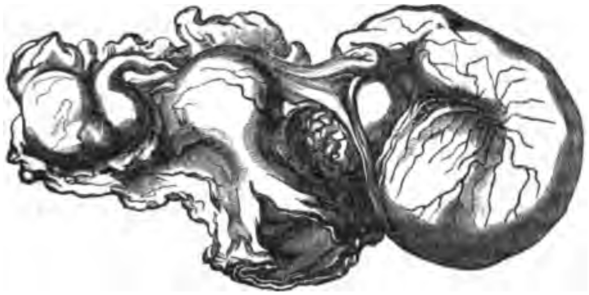
Deducting from this table the German cases, the mortality of which is countably great, there remain 244 cures, with 118 deaths, or 1 fatal about 2 recoveries.

SECT. III.—DISEASES OF THE FALLOPIAN TUBE.

Owing to the great difficulty of their diagnosis, the diseases of the Fall tube offer, surgically considered, little of interest. In fact, the only one requires any particular notice in a work of this kind, is dropsy. Incidents it may be observed that the tube is liable to displacements, morbid adhesions, inflammation, abscess, hypertrophy, tuberculosis, carcinoma, and fibrous tumors.

Dropsy of the Fallopian tube, fig. 640, is most common in middle-aged and elderly women who have borne children; the disease may be single or double, and is usually associated with organic lesion of the ovary, uterus, and pelvis. The cause of the affection is, in the first instance, occlusion of the orifices of the tube, which is thus placed in the condition of a shut sac. Gradually the mucous lining is transformed into serous tissue, which, taking on inflammatory action, pours out the fluid, upon the presence of which the dropsy depends. This fluid is perfectly clear and limpid, saline in its taste, and coagulable by heat, alcohol, and acids. In its size the cyst—for so it may be termed—varies from that of the small intestine to that of a fist, or even a fœtal head; it is of an elongated, conical shape, convoluted, folded, or bent upon itself, much larger at its fimbriated than at its uterine extremity, and irregularly constricted upon the surface, or divided by tight fibrinous bands. A number of vessels, tortuous and varicose, generally ramify over its exterior.

Fig. 640.



Dropsy of the Fallopian tube.

The *symptoms* of dropsy of the Fallopian tube are in general so closely merged in those arising from disease of the ovary, as to render it extremely difficult to discriminate accurately between them. The most important diagnostic signs are, 1st, the remarkable mobility of the tumor in the pelvis, where, unless it is of extraordinary size, it may be freely pushed about independently of the uterus; 2dly, its elongated, conical form, with the rounded base corresponding to the fimbriated extremity of the tube; and 3dly, its wavy, convoluted outline, or its undulated and indented surface, as if fibrous bands were stretched across it. The cyst is smaller than in ovarian disease, and seldom ascends materially above the level of the pubes. The difficulty of the diagnosis will be lessened if, as suggested by Dr. Simpson, the pelvic organs be examined simultaneously with both hands, one being placed over the fundus of the womb in the hypogastrium, while two of the fingers of the other are inserted into the vagina and anus, so as to make pressure in opposite directions. If all other means fail, recourse is had to the exploring needle, passed through the roof of the vagina. The escape of a clear, limpid, saline, and coagulable fluid will generally determine the true nature of the case.

The only *treatment* for this disease is tapping, performed with a delicate trocar, introduced through the upper and lateral portion of the vagina, pushed behind the broad ligament, at the posterior surface of which the cyst is situated. The fluid is drained off gradually, and a sufficient degree of inflammation generally succeeds to counteract any tendency to further secretion. Dr. Simpson states that in eight instances which he has thus treated, he has not been obliged to repeat the operation in a solitary one. Should paracentesis fail, a little dilute tincture of iodine may be thrown into the sac. Some vigilance is necessary, in either case, during the after-treatment, as the resulting inflammation may be too severe.

Examples are recorded in which rupture of a Fallopian cyst [illegible] over-distension, ulceration, external violence, or severe bodily exertion, [illegible] followed by effusion of its contents, and fatal peritonitis.

SECT. IV.—AFFECTIONS OF THE VAGINA.

The vagina is liable to various congenital malformations, inflammation, [illegible] occlusion, polyps, varix, prolapse, and cystic tumors.

a. The tube is sometimes *absent*, as a congenital defect. Of this [illegible] have seen three cases, all occurring in young married women. The [illegible] all were well developed, and the sexual desire was quite as strong [illegible] natural state, thus rendering it extremely probable that there was [illegible] the part of the ovaries. A careful examination by the finger in the [illegible] a catheter in the bladder, showed that the septum between these two [illegible] consisted simply of their opposed walls.

The vagina is sometimes very *short*, not, perhaps, exceeding a few [illegible] an inch or an inch. When the defect is associated with absence of the [illegible] the tube terminates in a cul-de-sac. Cases occur in which it opens [illegible] bladder, or into the rectum, thus receiving the contents of these reservoirs.

The vagina may be *double*. The septum sometimes extends the whole of the tube, dividing it into two cylindrical canals, each of which may [illegible] inferiorly by a separate aperture. Callisen refers to two cases in [illegible] canals thus formed were closed each by a perfect hymen. In some [illegible] which, however, are extremely rare, the frenum is situated transversely [illegible] tuting a kind of diaphragm, which prevents the flow of the menstrual fluid.

Finally, the tube may be present, and be well developed, but closed [illegible] matter, or by the existence of a hymen.

Some of these malformations admit of relief; others do not. Nothing [illegible] done when there is an absence of the vagina; the woman is impotent, and [illegible] fore, disqualified for marriage. When the tube exists, but is closed by a [illegible] growth or membrane, surgical interference will be necessary, consisting [illegible] in a few simple incisions. When the rectum terminates in the vagina, a [illegible] outlet must be made for it with the knife, an operation which is usually easy, as the orifice nearly always exists very low down. A vagino-vesical [illegible] ing should be closed by suture.

b. Foreign bodies, as pessaries, glass bottles, and pieces of wood, are [illegible] sionally inserted into the tube, where, if allowed to remain for any length [illegible] they are sure to cause severe inflammation, attended with exquisite pain [illegible] tenderness, and the most offensive discharge, simulating that arising from [illegible] nant disease. When they keep up constant pressure, ulceration may [illegible] as to establish a communication with the bladder or rectum, and the [illegible] then also liable to become greatly contracted. Riddance of the introd[illegible] generally be effected, though sometimes not without much difficulty, [illegible] fingers and forceps. When the resistance is excessive, it may be neces[illegible] break the foreign body, or to divide it with a saw, each piece being after[illegible] extracted separately.

c. The vagina is liable to ordinary and specific *inflammation*. The dis[illegible] marked by the usual anatomical characters, and is often attended with [illegible] discharges of purulent matter, of a very acrid nature, and mixed, at times [illegible] blood. In bad cases, abscesses are formed in the submucous cellular tis[illegible] and instances are witnessed where the parts are rapidly destroyed by gang[illegible] A coating of adventitious membrane is sometimes observed, especially [illegible] inflammation is connected with disease of the mouth and neck of the [illegible] Occasionally, again, there is a remarkable hypertrophy of the papillæ, [illegible] the surface of the vagina a peculiar granular appearance, the bodies stan[illegible] out like so many round, shot-like projections, of a vivid red color. The af[illegible] is particularly common during pregnancy, of which it is by some regarded [illegible] physiological condition.

Ulcers of the vagina are generally referable to the syphilitic, cancerous scrofulous poison, and do not differ from the same class of sores in other regions of the body.

A peculiar irritable ulcer, crack, cleft, or *fissure*, is sometimes met with at the mouth of the vagina, chiefly at its posterior commissure, in consequence, generally, of the slight laceration of the perineum, so liable to occur during first labor. It is usually very superficial, seldom, if ever, extending beyond the mucous membrane, and is often extremely painful, especially in walking, defecation, and sexual intercourse, or when urine is brought in contact with it, which always causes severe burning and smarting. The edges of the ulcer are red, rough, everted, and slightly elevated, its surface being incrusted with lymph, and the seat of a thin, sanious discharge. If neglected, the disease may last for years, and produce great local and constitutional distress with progressive emaciation and debility.

The nature of these lesions may be suspected when there is more or less copious discharge, but can only be positively determined by a careful examination with the speculum.

The *treatment* is antiphlogistic; by rest, purgatives, and light diet, with astringent injections, as solutions of lead, zinc, alum, or copper. If ulceration exists, nitrate of silver or acid nitrate of mercury may be necessary. Separation of the opposed surfaces with a tent of patent lint, wet with some medicated lotion, or smeared with dilute ointment of the nitrate of mercury, will generally greatly expedite the cure. The treatment of specific vaginitis is briefly discussed in the section on gonorrhœa.

The most effectual remedy for fissure of the vagina is free scarification; or, this failing, complete division, precisely as in fissure of the anus. Sometimes the milder cases recover under the use of nitrate of silver.

d. Occlusion of the vagina is observed chiefly in married females, as a result of severe and neglected inflammation after delivery. Children and young girls, however, are by no means exempt from it. The affection occurs in several varieties of form and degree. In the milder cases, the adhesion generally exists very low down, merely as a slight agglutination of the contiguous surfaces; but under opposite circumstances the union may be complete, reaching from one end of the tube to the other. Such an effect may be the result of ordinary inflammation, and is then a comparatively simple affair, especially if it has not been too long neglected; very frequently, however, it is caused by injury done to the parts during labor, eventuating in gangrene and sloughing, and the ultimate development of an inodular, inextensible tissue, so as to render the case one almost of a hopeless character.

The only remedy for this affection is the separation of the contiguous surfaces, which, as already hinted, is occasionally easy enough. When the case is a slight one, the fingers alone sometimes suffice for the purpose. At other times the operation is readily performed with the handle of the scalpel, aided, perhaps, by a few touches with its cutting extremity. But the task is a very different one when the adhesion is firm and extensive. In such a case nothing but the most patient and cautious dissection will suffice, the knife being carried up in the natural direction of the tube, while the left index-finger is in the rectum and a catheter in the bladder, to serve as guides to the instrument, lest it should penetrate these cavities, and thus cause an intestinal or vesical fistule. Moreover, the operation is not undertaken without due preparation of the system, and a statement of its dangers. I have myself seen two women promptly perish from peritonitis induced by attempts to re-establish the vagina, although I am perfectly certain that the operation could not possibly have been better done.

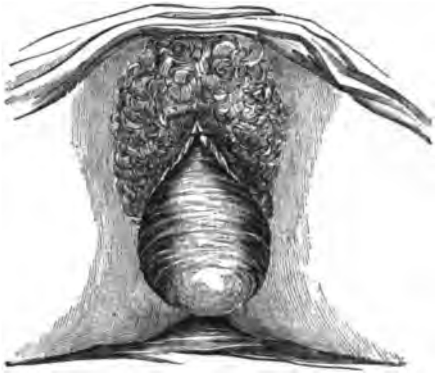
The *after-treatment* in these operations must be conducted with great care and vigilance. A well-oiled tent of patent lint is inserted, to prevent readhesion of the contiguous surfaces, renewal being effected whenever it is demanded by cleanliness. When the cicatrization is completed, a gum-elastic bougie should frequently be introduced, to restore the tube to its normal diameter. When there has been loss of substance of the vagina, even to a slight extent, incessant vigilance will be required to counteract the tendency to contraction and readhesion.

e. Stricture of the vagina, properly so called, from morbid deposits in its walls or the presence of firm cicatrices, is occasionally met with, and may require attention on account of its interference with coition, parturition, and cleanliness. The milder cases will generally yield to dilatation; in the more severe, free incisions, aided by tents of compressed sponge, will be necessary. Firm cicatrices, obstructing the descent of the child's head, must be thoroughly divided, by two or three small incisions on each side of the vagina, the operation being performed during the existence of a labor-pain, when the parts are upon the full stretch. The anterior and posterior walls of the tube should not be interfered with, lest the bladder and rectum be endangered. Large incisions should be avoided.

f. Polyps are occasionally, though rarely, developed in the walls of the vagina. Tumors of this description may attain a very considerable magnitude, so as not only to distend the whole tube, but project some distance down the thighs. Their weight has been known to exceed ten pounds. The proper remedy is evulsion or ligation.

g. Prolapse of the vagina is most common after middle age, in married females who have borne children, and who have long suffered under a relaxed condition of the genito-urinary apparatus. The disorder, which is generally combined with, if not directly dependent upon, prolapse of the uterus, may be limited to the anterior or posterior wall of the tube, or it may embrace its entire circumference. In the latter case, the vagina forms a large tumor, soft, elastic, and of a red, bluish, or lead color, passing beyond the vulva, and hanging down between the thighs, as in fig. 641. In prolapse of the anterior wall, there is generally a descent of the bladder, which exhibits itself as a globular or ovoidal swelling at the upper part of the vulva, and which may be greatly reduced in size, if not entirely effaced by catheterism. Considerable irritability of the bladder generally accompanies this complaint, attended with a frequent desire to micturate, and more or less tenesmus. As the organ can never entirely empty itself, the retained urine soon becomes decomposed, fetid, and surcharged with ropy mucus, or mucus and pus.

Fig. 641.



Prolapse of the vagina.

Prolapse of the vagina is liable to be confounded with protrusion of the uterus and polyps of this organ. The principal points in the ***diagnosis*** are the soft and compressible character of the tumor, and its conical, globular, or ovoidal shape. In prolapse of the uterus, the swelling is hard, and the examiner may always readily determine the existence of the orifice of the organ. A polyp is firm, incompressible, and irreducible. In prolapse of the anterior wall of the vagina, constituting what is usually termed *vaginal cystocele*, the tumor enlarges as the urine accumulates, and diminishes during its evacuation.

The *treatment* of this affection consists, in its earlier stages, in the use of astringent injections, and of medicated tents, large enough to oppose the descent of the parts, and retained by an appropriate apparatus. In the anterior protrusion, the bladder should be frequently emptied, to prevent the pressure of the water from forcing down the tumor, and the uterus should be well supported with a stem-pessary, worn steadily for several months, the woman being nearly all the time recumbent. By careful perseverance with this treatment an excellent cure may occasionally be effected in a very short time, even in cases of an apparently unpromising character.

When the cystocele is of long standing, or unusually obstinate, an elliptical portion of the mucous membrane of the vagina may be carefully dissected off, and the edges of the wound brought together by several points of the interrupted suture; the object being retrenchment of the redundant structures. In the posterior descent, special attention must be paid to the state of the bowels, as straining and the impaction of fecal matter are the most frequent causes of the complaint.

h. A *cystic tumor* is sometimes observed in this tube, consisting in a morbid enlargement of one of the mucous follicles. It has a strong, thick, fibrous wall, with a polished internal surface, and is occupied by a clear, glairy, yellowish, viscid fluid. Seldom exceeding the volume of a chestnut or a pigeon's egg, it is more or less tense, but fluctuating, tardy in its growth, very sensitive, and, at times, even painful.

I once saw a swelling of this kind immediately beneath the orifice of the urethra in a young lady, the mother of four children. It was of a spherical shape, about the size of a walnut, and of a white, glossy appearance, with a rough, corrugated surface. It had existed for eight years. The tumor was freely opened with the lancet, the incision giving vent to a considerable quantity of a viscid, glairy fluid, like the white of egg, and the parts soon got well.

i. Under the name of *vaginismus* Dr. J. Marion Sims, in 1862, described a peculiar affection of the vagina, characterized by painful spasmodic contraction of its sphincter muscle, accompanied by such a degree of sensitiveness of the surrounding structures as to form a complete barrier to coition and to the introduction of instruments. Its discovery is generally purely accidental. The gentlest touch with the finger, a probe, a feather, or even a camel hair pencil, causes the most exquisite agony. Every portion of the outlet of the vagina is sensitive, but often the most tender point of all is at the fourchette. The hymen is usually thick and voluminous, and the orifice of the vagina is as firm and unyielding as if bound by a fine cord. The sphincter muscle of the anus, in many cases, feels almost as hard as a ball of ivory. The general health is commonly much deranged, the patient being exceedingly nervous, impressible, and wretched. The affection, which is occasionally accompanied by marked evidence of inflammation, as patch-like redness and enlargement of the mucous papillæ, is invariably complicated with rectal and vesical irritation. Its exciting cause cannot always be ascertained.

The pathognomonic sign of vaginismus is spasm of the sphincter muscle of the vagina; the diagnostic, supersensitiveness of the surrounding surfaces. The only affections with which it is liable to be confounded are occlusion of the vagina and the existence of an imperforate hymen. It is obvious that this disease possesses a strong resemblance to anal fissure.

The *treatment* which Dr. Sims has found most efficacious in vaginismus is free division of the affected parts. The patient being fully anæsthetized, and placed on her back, as in the operation for lithotomy, the surgeon inserts the left index and middle fingers into the vagina, and, separating them laterally as widely as possible, thus puts the fourchette well on the stretch. A deep cut is then made with a common scalpel through the resisting tissues, on each side, nearly two inches in length, commencing a short distance above the upper border of the sphincter muscle, passing across its substance for several lines, and terminating at the raphé of the perineum. To complete the cure, a suitable dilator—generally one of glass or of gilt metal—is worn until the incisions are cicatrized. Sometimes relief may be effected simply by incising the mucous and submucous cellular textures.

SECT. V.—AFFECTIONS OF THE VULVA.

1. *Labia.*—The great lips are liable, during delivery, to *hemorrhagic* infiltration from a rupture of some of the neighboring vessels. The lesion usually

involves only one of these organs. The tumor which is thus formed is generally of an irregularly oblong shape, with a dark livid surface, more or less compressible, and about the size of a hen's egg. Occasionally, however, it is much larger, equalling the volume of a fœtal head, and containing from ten to twenty ounces of blood. The effusion commonly takes place suddenly, or in a very short time, and, when copious, it almost always makes its escape spontaneously, by lacerating the superincumbent textures, or it remains, and speedily induces inflammation and gangrene. In the latter case, the blood is generally of a very black color, partly fluid and partly coagulated, and emits a highly offensive odor. The infiltrated tissues are sometimes frightfully lacerated, and converted into a dark, shreddy substance, without any trace whatever of their original characters.

When the tumor is small, it will usually soon disappear under cooling, sorbefacient applications, as solutions of acetate of lead, alum, or hydrochlorate of ammonia, along with opium; but, under opposite circumstances, the only effectual remedy is prompt evacuation by free incision.

The labia are liable to incised, lacerated, and contused *wounds*, the chief interest of which arises from the excessive swelling and hemorrhage that so often attend them. Quite a number of cases have been reported in which the bleeding, in incised wounds, was so copious as to prove fatal in a few hours. The treatment involves nothing peculiar.

Inflammation of the labium may be produced by various causes, and requires the usual remedies for its subdual. Should matter form, the occurrence will be denoted by increase of heat and swelling, the inordinate hardness of the part, and the throbbing character of the pain. Relief is afforded by an early and free incision, the surgeon not always waiting for distinct fluctuation.

A chronic *abscess* is sometimes met with in this situation. A few years ago a married female, aged twenty-six, came to me with a swelling in the left labium of nearly four months' standing, hard, free from pain, and without any constitutional disturbance. The insertion of an exploring needle was followed by an escape of pus, which, when fully evacuated, amounted to upwards of five ounces.

The external lip may be the seat of different kinds of *ulcers*, either simple or specific, most commonly seated upon its mucous surface, or at the junction of this surface with the cutaneous. The disease sometimes affects the mucous follicles, the sore presenting itself in the form of a small depression, perhaps not larger than a pin's head. The chancrous ulcer is generally readily distinguished by its history, its large size, its tendency to spread, its obstinacy, and the abundance of the attendant discharge. The common ulcer is often occasioned by want of cleanliness, friction, or disorder of the digestive apparatus.

The *treatment* of ulceration of the vulva must depend upon the nature of the exciting cause. The most important remedies, as a general rule, are frequent ablutions with soap and water, and astringent lotions, applied by means of patent lint in such a manner as to insure constant isolation of the opposed surfaces. Recumbency, light diet, and purgatives are indispensable auxiliaries. If the ulcers have a tendency to spread, they should be gently touched once a day with a weak solution of acid nitrate of mercury. The indurated chancre may require slight ptyalism.

Mortification of the vulva is uncommon. It is most liable to occur in worn-out, intemperate, anemic females, as a consequence of syphilis, and must be treated upon general principles.

Mr. Kinderwood, many years ago, described a fatal disease of the vulva of young children, which, commencing at one or more points of the mucous surface, rapidly spreads over the nymphæ, clitoris, and hymen. Gangrenous spots appear in a very short time, and continue to enlarge until the parts are converted into dark-colored, fetid sloughs. Great prostration of strength, accompanied by fever and severe pain, is the most prominent symptom of the complaint. The treatment consists of tonics, milk punch, anodynes, and the application of the dilute acid nitrate of mercury, with warm water-dressing, simple or medicated.

Œdema of the vulva is occasionally witnessed; chiefly during the latter months of pregnancy, or soon after delivery, and in females of a broken constitution, in combination with ascites and anasarca. Enormous tumefaction, either circumscribed, or more or less diffused, may thus be produced, terminating, unless timeously relieved, in severe suffering, if not in gangrene. The proper remedy consists in the removal of the exciting cause, and a few minute punctures, to admit of the escape of the pent-up fluid, followed by astringent lotions, or pencilling of the affected parts with dilute tincture of iodine.

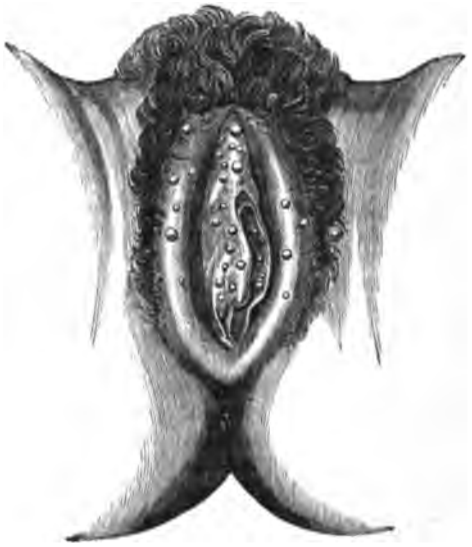
Erysipelas of the vulva is usually of the œdematous character; the disease is easily recognized by the nature of the pain and swelling, and is treated upon general principles, early and free incisions forming an important element of the management.

Fistule of the vulva is generally caused by an imperfectly healed abscess or ulcer, and is often a very troublesome complaint, keeping up discharge and irritation. It may be limited to the labium, or extend into the vagina, perineum, anus, or even the bladder. The diagnosis can only be established with the probe. A cure may sometimes be effected by strong injections of iodine, but the best and speediest remedy, by far, is the free division of the parts with the blunt-pointed bistoury. The operation, however, is liable to be followed by profuse venous hemorrhage, and should therefore be conducted with proper circumspection.

There is a form of inflammation of the vulva, which, occurring at different periods of life, but especially in married females, has its principal seat in the *mucous crypts*. It usually shows itself in small patches, of a red, almost scarlet complexion, studded with minute points, which are slightly elevated above the surrounding level, and perfectly distinct from each other. As it progresses, the points increase in volume, and ultimately coalesce, so as to impart to the surface a rough, granulated appearance. At this stage, and, indeed, often before the morbid action has reached this height, some of the glands become ulcerated, the sore looking, at first, like a mere speck, but gradually growing larger and larger until it has acquired the size of a split currant or small pea, its edges being steep, ragged, and, perhaps, partially undermined. The affection is, in every respect, analogous to follicular ulceration of the bowel.

These crypts are liable to chronic inflammation, attended with hypertrophy. When thus affected, they present the appearance of little vesicles, charged with a thick, mucous fluid, not unlike the white of egg, or the contents of the enlarged follicles which are sometimes seen upon the lips of the uterus. These appearances are well illustrated in fig. 642.

Fig. 642.



Follicular disease of the vulva.

In the *treatment* of this affection the most suitable local remedies are leeches, astringent lotions, and dilute tincture of iodine. When it assumes the chronic form, great relief will be afforded by weak citrine ointment. Rest, light diet, and purgation will be important auxiliaries.

Pruritus of the vulva, or eczema of the mucous membrane of the vulva and vagina, is often met with, both in single and married women, but more especially the latter, and is frequently a source of the greatest possible distress, from the violence of the accompanying itching. The disease is most common in females with light hair and eyes, and is generally dependent upon disorder of the digestive apparatus. The parts, which are often very dry, have usually a cracked, chapped, or fissured appearance. Minute vesicles, resting on a reddish base, are sometimes present.

The *treatment* of this affection is very uncertain. The most reliable remedies are steady purgation, a restricted, cooling diet, frequent ablutions, and the application of zinc ointment, with solutions of borax, acetate of lead, and bichloride of mercury, of which the latter is one of the best. Hot water often affords temporary relief. If plethora exist, blood may be taken from the arm, or by leeches from the groins and vulva. If, on the contrary, the patient is anemic, a course of chalybeate tonics should be instituted.

Inversion of the *hairs* of the labia, an affection for the first time described, in 1862, by Dr. Meigs, and closely resembling trichiasis, is occasionally met with, and may become a source of great suffering from the teasing irritation which it keeps up in the mucous membrane, attended with great redness and excessive itching. The remedy consists in pulling out the stiff and incurvated hairs with a pair of tweezers.

Warty excrescences are often seen within the vulva. In some instances they extend into the vagina, and down the perineum as far as the margin of the anus. Their number may be very great. I have occasionally counted upwards of a hundred, of all sizes, from that of a mustard-seed to that of a raspberry. Usually they are of a pale, florid color, of a fibro-cartilaginous consistence, rough on the surface, pediculated, and somewhat painful on pressure. Occasionally they are grouped together, running into each other, and thus forming large fissured masses. Their origin, in most cases, is referable to the effects of the gonorrhœal and syphilitic poisons.

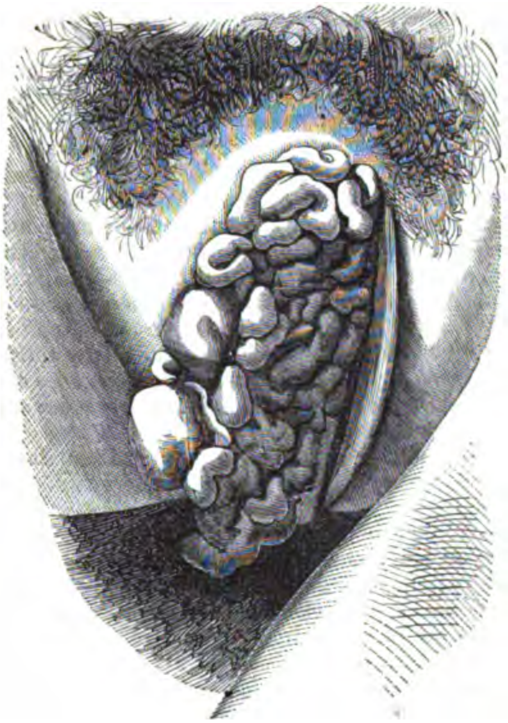
The *treatment* is similar to that of warty excrescences upon the penis. The most efficacious remedy is chromic acid, applied every other day, the parts being in the meantime thoroughly isolated. The largest growths occasionally require excision. If the disease is very rebellious, slight ptyalism will be useful.

Polyps of the vulva are of very infrequent occurrence. They are generally of a pyriform figure, conical, or globular, and attached by a long, narrow pedicle. In their volume they vary between an almond and a child's head, though they rarely exceed that of the fist. Occasionally they are so large as to hang down between the knees. At an early period they are of a spongy consistence, and of a bright florid color; but they are liable to become hard, and to assume a pale, mottled appearance, especially when they project beyond the vulva. Ulceration occasionally occurs, followed by a copious discharge of bloody, fetid matter. Their structure is usually of a soft, fleshy nature, either uniformly, or interspersed with serous cysts, or masses of fibro-cartilage. The only remedy is removal with the knife or ligature.

The labia, nymphæ, and lower part of the vagina are sometimes the seat of *varicose veins*, as seen in fig. 643; the disease, which is most common in middle-aged subjects, is usually associated with varicose enlargement of the veins in the inferior extremity, and is liable to great aggravation during pregnancy and delivery. The veins are spread out in an irregularly arborescent manner, and may be many times the natural size. The coats of the vessels may be entirely healthy, but more frequently they are diseased, being attenuated at one point, and thickened at another. In some cases the lining membrane becomes inflamed, causing coagulation of the blood, and the formation of pus. During parturition, the enlarged veins may be ruptured by the pressure of the child's head, inducing copious, if not fatal, hemorrhage. No treatment is generally required beyond an occasional purgative, recumbency, and the use of cold water. Should the veins be accidentally ruptured, and the hemorrhage become serious, the bleeding vessels must be sought for, and ligated.

Occlusion of the vulva, dependent upon adhesions of the labia, or the labia and nymphæ, is not uncommon. The occurrence is sometimes observed in very young children, occasionally, indeed, in infants at the breast, and is, of course, always the result of inflammation, not unfrequently caused by want of cleanliness, or the accidents of parturition. When the adhesion is slight, it is easily broken up with the probe or finger; when, however, it is extensive, the knife may be required, used prudently, lest more be divided than is proper.

Fig. 643.



Varicose veins of the vulva.

There is occasionally a collection of water in the labium, a species of *hydrocele*, either congenital or acquired. The fluid is situated in the peritoneal sheath of the round ligament, known as the canal of Nuck, and forms a small, elongated, undulating, fluctuating swelling, which sometimes communicates with the abdomen. The affection is exceedingly rare. The diagnosis is readily established by the history of the case and by the use of the exploring needle. A cure may be effected by incision, by seton, or by injection.

Finally the labia are liable to various kinds of *tumors*, as the fibrous, cystic, fatty, and sebaceous, as well as to scirrhus and encephaloid.

The *fibrous* tumor does not always originate in the labium, but may take its rise deep in the pelvis, and, advancing outwardly, involve the vulva secondarily. It is most common in young married females, and is capable of acquiring a large bulk, especially in the tropics, where it is much more frequent than in this country. Its shape is usually somewhat pyriform, its attachment being by a small base which often extends to a considerable depth. It is of a firm, slightly elastic consistence, movable, free from pain and discoloration, and little disposed to ulceration, its principal inconvenience being caused by its weight and bulk. As it enlarges, it gradually distends the labium, elongating it and dragging it down between the thighs.

A section of the tumor displays a dense, firm, glistening tissue, not unfrequently interspersed with small cavities, resembling cysts, which are filled with a clear, serous, gelatinous, or sanguinolent fluid, sometimes spontaneously coagulable. The older growths of this description occasionally contain nodules of cartilage, or small earthy concretions, similar to those found in fibrous formations of the uterus. In some cases the structure of these tumors is of a fibro-cellular, or fibro-plastic, instead of a strictly fibrous nature.

The fibrous growth of the labium, notwithstanding it sometimes attains a great bulk, possesses little vascularity; its production is occasionally traceable to the effects of external injury, and it now and then, as in a case which I attended with Dr. McWhinnie, presents a distinct fibro-serous envelop.

The only proper remedy for the cure of this tumor is excision. In some instances the whole mass may readily be got rid of by enucleation. When the growth is prolonged into the pelvis, the pedicle, after suitable exposure, should be included in a ligature. The operation is seldom attended with much hemorrhage.

Cystic tumors, filled with serous, glairy, or dark-colored fluid, and of a spherical, ovoidal, or pyriform shape, are occasionally met with in the labia; they are generally unilocular, semi-transparent, circumscribed, more or less fluctuating, and firmer than œdema, but not so hard as fibrous tumors. They may be caused by external injury, and, if unmolested, may ultimately attain a bulk equal to that of an infant's head. The treatment is by iodine injections, seton, or, what is better, excision.

There is a form of cystic tumor which is occupied by a thick glairy mucous fluid, and which is evidently occasioned by the closure of a mucous crypt with retention of its natural secretion. It is similar to the tumor sometimes found on the lip, and requires similar treatment.

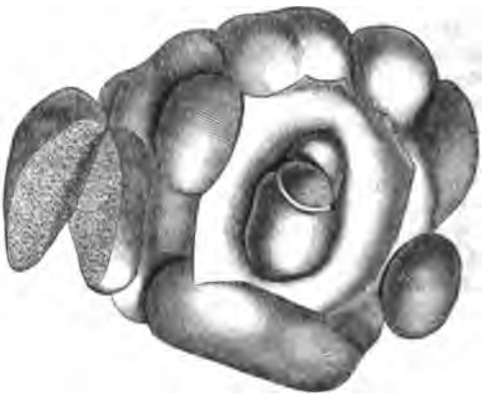
The *fatty tumor* of the labium is uncommon; it is of slow growth, soft and doughy in its consistence, and seldom attains much bulk. Occasionally it presents a nodulated appearance, as if it were composed of several distinct masses. It requires the same treatment as similar formations in other parts of the body.

Dr. G. B. A. Hanuschke has recorded a case of fatty tumor in the labium of a woman, aged thirty-six, that weighed nearly twelve pounds. It formed an immense pendulous mass, of a pyriform shape, with a large pedicle firmly attached to the branches of the ischium and pubes. The operation, although very bloody, was perfectly successful.

The *sebaceous tumor* of the labia is also very rare. It is usually of a globular form, perfectly movable, free from pain, firm, but semi-elastic, and from the volume of a hazelnut to that of a pullet's egg. The treatment is by excision.

Scirrhus and encephaloid of the labia may occur as primary affections, but more frequently they extend to these structures, from the clitoris and the nymphæ; in some cases they are evidently offsprings of cancer of the uterus and vagina. The two diseases are characterized by the same phenomena as scirrhus and encephaloid in other organs, and demand the same treatment, the only reliable remedy being early extirpation.

Fig. 644.



Encephaloid of the nymphæ and clitoris.

2. *Nymphæ.*—The nymphæ are not often the subjects of disease, independently of that of the great lips. They are occasionally the seat of hypertrophy or chronic enlargement, so excessive as to require excision, of encysted tumors, and of encephaloid cancer. Of the latter disease, I met with an extraordinary case, in 1842, in a little girl, five years of age, who died, exhausted, at the end of nine months from the first appearance of the tumor. The morbid growth, as seen in fig. 644, had exten-

ely involved the lymphatic ganglions of the groin and pelvis. The clitoris s also greatly enlarged.

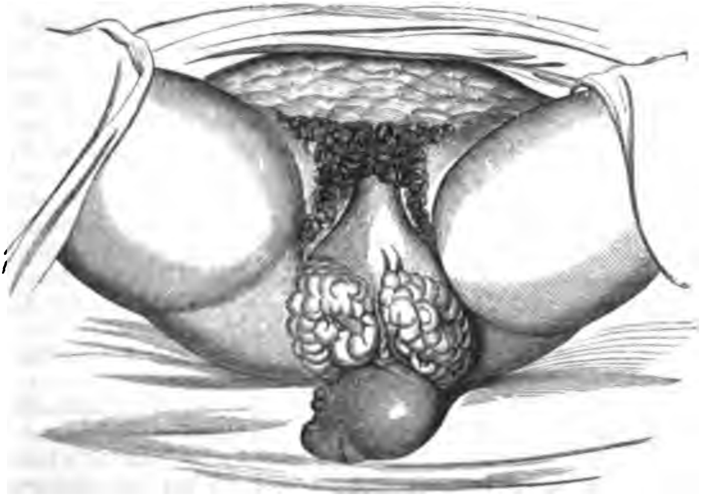
An *encysted tumor*, filled with serum, sometimes occurs in the nympha; nerally in married females, from the twenty-fifth to the fortieth year. It is soft, ctuating, of a rounded or ovoidal form, and of variable dimensions, from that an almond to that of an orange. The diagnosis is easily established by the ploring needle. The most effectual remedy is excision, but a cure may also be ected by the seton and by iodine injections.

A *polyp* occasionally grows from the nympha, as in a case which came der my notice in 1862, in a little girl only eight years of age. The tumor was a scarlet color, granulated and fissured on the surface, destitute of sensibility, d about the size of a large hickory-nut. It adhered to the outer surface of e nympha by a short, narrow pedicle, and completely closed the orifice of the lva. It had been first observed about one year previously. Removal was adily effected by ligation.

3. *Clitoris.*—The principal affection of the clitoris is hypertrophy, which occa-nally amounts to such a degree as to become a source of great inconvenience d annoyace. In some countries this organ is naturally much larger than in merica and Europe. In Persia, Turkey, and Egypt, hypertrophy of the clitoris often immense, the tumor thus formed perhaps equalling the size of an adult's ad. The disease, which is sometimes congenital, is generally caused by pro-acted irritation. Courtesans were formerly supposed to be particularly prone attacks of this kind, but the researches of Parent-Duchatelet and others have own that this is not the fact. When the growth has acquired a large bulk, the ly remedy is excision. The operation is usually attended with a good deal of morrhage. When the disease is in its infancy, repression may be attempted ith cooling and astringent lotions, tincture of iodine, and other sorbefacient eans.

The annexed cut, fig. 645, affords a good idea of this affection. The growth as associated with hypertrophy of the nymphæ.

Fig. 645.



Hypertrophy of the clitoris and nymphæ.

The clitoris has occasionally been removed on account of erotomania, even when it was not materially enlarged. Such an operation is on a par with the amputation of the penis for the cure of onanism. Nothing could be more absurd.

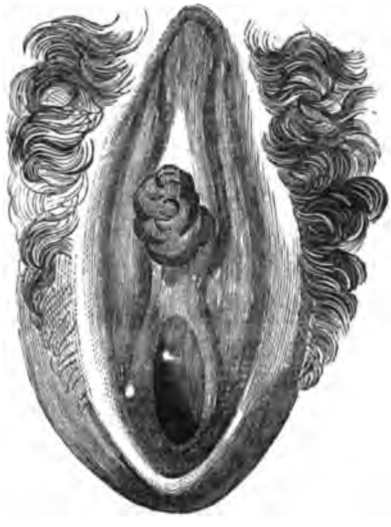
A case of *wound* of the clitoris, followed by fatal hemorrhage within an hour after its occurrence, has been reported by Mr. Gutteridge, in the London Lancet for October, 1846. The accident was caused by a kick. The wound, situated at the entrance of the vagina, along the ramus of the pubes, was one inch in length by three-quarters of an inch in depth, and completely exposed the left crus of the clitoris, the cavernous structure of which was thoroughly crushed.

4. *Urethra.*—The female urethra is rarely diseased. The principal lesions to which it is liable are, stricture, dilatation, and vascular excrescences.

a. Stricture is usually situated at the extremity of the tube, and may be so great as to produce much difficulty in making water. In some congenital malformations, the orifice of the urethra opens into the vagina at some distance from the external aperture. Occasionally, as when the mouth of the vagina is closed by a dense membrane, the urethra is so much dilated as to admit the male organ. These various affections must be met on general principles.

b. Vascular excrescences sometimes spring from the female urethra, or are seated around its orifice, as shown in fig. 646. They are of a bright scarlet color, exquisitely sensitive under pressure, and of a soft, spongy, erectile structure, with a smooth, fissured, or granulated surface. Their shape is generally pear-like, and in size they vary from a small pea to that of a horse-bean. The disease has been observed in young girls under seventeen, but is most common in adults. Its causes are unknown. The proper remedy is excision, followed by the gentle application of chromic acid.

Fig. 646.



Vascular excrescences of the urethra.

c. Many years ago I assisted my friend, Professor Willard Parker, in removing a *polyp* from the entrance of the urethra of a young lady of eighteen. It was of a conical shape, nearly an inch and a half in length by three-quarters of an inch in diameter, very sensitive, of a bright, florid color, elastic and compressible. On maceration for a few days, it became perfectly white, and seemed to be composed essentially of soft, cellulo-fibrous substance, pervaded by numerous bloodvessels. Removal of such growths may be effected by ligature or excision.

d. Inversion and prolapse of the bladder presents itself under two distinct varieties of form; the complete and the incomplete; the first consisting in an inversion of all the tunics of the bladder, while, in the second, the inversion is limited exclusively to the mucous membrane. The immediate cause of both varieties is a relaxed and weakened state of the parts, attended with dilatation of the urethra. The exciting cause is violent and frequent straining, such as accompanies various impediments to the evacuation of the urine and feces. Severe coughing may be mentioned as a predisponent.

In the *treatment* of the incomplete form of inversion and prolapse, the circumstances mainly to be attended to are, first, to enjoin strict recumbency for a long time; secondly, to reduce the tumor carefully, and to counteract afterwards any tendency to protrusion by the frequent use of the catheter, and astringent washes and injections; and, thirdly, to correct the general health by chalybeate tonics and other means. The bowels should be maintained in a soluble condition, and the urine should be passed in the recumbent posture, the patient lying on her side or back. Excision of the protruded part should be studiously avoided, as it might lead to fatal results.

Of the *complete* variety of inversion and prolapse of the bladder, very little is known. The most important signs, in a diagnostic point of view, are, the gradual development of the tumor, its soft and fluctuating feel, and the peculiarity of its situation. When we add to these circumstances the fact that there are usually three distinct apertures on the surface of the tumor corresponding with those of the urethra and ureters; that the tumor is easily reduced by pressure; that the patient is unable to retain her urine; that the part is not particularly tender, sore, or painful; and that there is not, at least not necessarily, any derangement of the general health, the practitioner can hardly fail to detect the true nature of the malady.

In the reduction of the tumor, the patient is placed upon her back, the head and shoulders are elevated, and the thighs, flexed upon the pelvis, are widely separated from each other. The labia are then held apart by an assistant, while the surgeon applies his fingers, previously oiled, to the surface of the tumor, and pushes up that part which came down last, the pressure being maintained steadily, but gently, until the whole of it has slipped up behind the pubic symphysis. When the swelling is bulky, and of long standing, it may be necessary to assist these efforts by means of a catheter, applied to the fundus of the bladder, and carried up in the direction of the urethra.

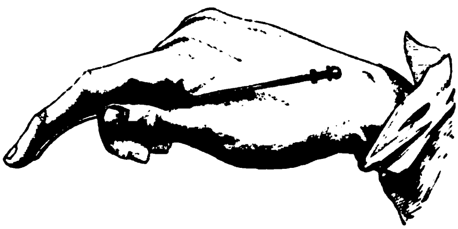
If the tumor has become irreducible, an attempt should be made to diminish its volume and hardness by leeches, fomentations, and other relaxing measures. Chloroform is a valuable adjuvant during replacement.

When the parts are restored, the patient should observe the recumbent posture, the urine should be drawn off frequently, and, if the protrusion be considerable, a compress, confined by a T bandage, should be worn upon the mouth of the urethra. When the patient gets up, she should wear an abdominal supporter.

When the urethra is much dilated, an operation may become necessary. The inferior portion of the tube may be divested of its mucous membrane, after which the raw surfaces are approximated by a few points of interrupted suture, care being taken to draw off the urine several times a day, until consolidation is perfected.

e. Catheterism in the female should always be performed with great delicacy under cover of the clothes, while the patient lies upon her back, near the edge of the bed. Ocular inspection can only be justifiable when the parts are in a state of great disease, or when the tube has undergone much change in its relative position. The best mode of proceeding is to apply the left index-finger to the upper margin of the orifice of the vagina, which thus serves as a guide to the instrument, which is placed upon its palmar surface, and then moved upwards along the middle line, until its point arrives at the dimple-shaped depression, marking the situation of the orifice of the urethra. The catheter is then passed on, with its concavity upwards, until it reaches the interior of the bladder. Or, the instrument may be held against the under surface of the right index-finger, as in fig. 647, and pushed on as soon as its tip has discovered the meatus.

Fig. 647.



Method of some surgeons of holding the female catheter.

The female catheter is made of silver, and is not more than five inches in length. Its vesical extremity is somewhat bent, to adapt it to the shape of the urethra, and is perforated with numerous foramina, instead of having eyelets, as that of the male. The other end is provided with two rings, in order to fasten the instrument, when it is necessary to retain it in the bladder, by means of tapes, to a T bandage.

It has long been known that the female cathether will occasionally slip into the bladder, being suddenly and unexpectedly drawn from the fingers of the surgeon. It is not very easy to explain the reason of this occurrence. It is probably owing to the contractile power of the urethra, aided by capillary attraction, and by the suction of the bladder.

Although, in general, the female cathether is more easily withdrawn than introduced, yet occasionally the reverse is the case. The occurrence is favored by a relaxed condition of the parts, and appears to be directly dependent upon the intromission of a fold of mucous membrane into the eyelets of the instrument. To avoid this contingency, as awkward as it is painful, the instrument should be provided with numerous small apertures, which will effectually prevent the intrusion of the lining membrane, however flabby. The proper remedy is the retention of the catheter until the accumulating urine forces the impacted folds into their natural situation. All attempts at forcible extraction should be avoided.

SECT. VI.—GONORRHŒA IN THE FEMALE.

Gonorrhœa in women is a very different affection from gonorrhœa in males; in the latter, the disease is generally exclusively confined to the urethra, or it exists simultaneously in this canal and on the head of the penis. In the female, on the contrary, it usually expends its force upon the lining membrane of the vulva, vagina, and uterus, the urethra being seldom implicated to any considerable extent. The parts which are generally most violently inflamed are the mucous follicles around the urinary meatus, and in the upper portion of the vagina. Occasionally the disease extends into the cavity of the uterus, and thence, there is reason to believe, along the Fallopian tubes and ovaries, the attack thus presenting an analogy with gonorrhœa in the male, eventuating in epididymitis. The interior of the uterus is most liable to become affected in those females in whom that organ has an uncommonly large mouth, thereby allowing the more easy entanglement and retention of the gonorrhœal virus. The occurrence is, however, under any circumstances, unusual. The time which elapses between the contamination and the outburst of the disease is generally somewhat shorter than in men, owing to the fact that the poison is brought in contact with a larger surface. The disease may be simple or complicated; it is more frequently associated with chancre than in the male, and is often followed by excoriations and simple ulcers, especially of the neck of the uterus and of the lower extremity of the vagina.

The *symptoms* of the disease are essentially similar to those which characterize gonorrhœa in the male. The parts, at first the seat of itching and smarting, soon become hot, swollen, painful, and affected with muco-purulent discharge, often bloody, usually excessively profuse, and, at times, quite fetid and even acrid. The scalding in micturition is considerable, though rarely as great as in the male, and the labia, nymphæ, vagina, and the neck of the uterus, are frequently covered with aphthæ, fissures, and excoriations. In the more severe forms of the disease, there are a sense of weight and fulness in the lower part of the pelvis, and aching pains in the groin, thigh, and perineum. The lining membrane of these parts is of a fiery red color, and covered, here and there, with patches of lymph, of a pale yellowish hue, tough and stringy, and firmly adherent to the surface beneath. During the progress of the attack, the lymphatic ganglions in the groin are apt to suffer, becoming sore, and swollen; and so much pain and tenderness are often experienced in walking as to compel the woman to keep her bed. Occasionally the inflamed surfaces, instead of being bathed with pus and mucus, are remarkably dry, and the distress is then often proportionately much greater.

In uterine gonorrhœa, the most common symptoms are, unnatural discoloration, and a discharge of thick, opaque mucus, filling up the mouth of the womb, or hanging from this organ into the vagina, and so tough as to be detached with considerable difficulty. Superficial ulceration is also a sufficiently frequent attendant upon this form of the disease.

The *diagnosis* of gonorrhœa from other affections, especially leucorrhœa, although most desirable, is frequently very difficult, and sometimes altogether impossible. The distinction is particularly important on account of its medico-legal relations, females laboring under discharge of the genital organs being often suspected of having gonorrhœa, when, in fact, the disease is only of an ordinary nature. In general, the difficulty may be solved by the history of the case, the moral character of the woman, the nature of the discharge, and the presence or absence of complications. In leucorrhœa, with which the disease is most liable to be confounded, there is seldom any discharge from the urethra, or scalding and smarting in micturition; in gonorrhœa, on the contrary, these two symptoms usually exist in a very marked degree. In leucorrhœa, the disease is mostly confined to the vagina and uterus; the discoloration, although considerable, is seldom either great or uniform, and the vulvo-uterine canal is usually free from ulceration. In gonorrhœa, the inflammation always involves the labia and nymphæ; the redness is of a fiery hue, and extensively diffused, the parts having almost an erysipelatous aspect, and marked abrasions, excoriations, or superficial ulcers are nearly constantly found upon the neck of the uterus, as well as upon the vagina. Finally, in leucorrhœa the pain is comparatively slight, and there is no disease of the lymphatic ganglions of the groin, the reverse being the case in gonorrhœa.

In attempting to form an accurate diagnosis of these diseases, too much caution cannot be exercised, otherwise there will be great danger of occasionally involving the innocent. A thorough examination should always be made with the speculum, not once, but repeatedly, and the moral character of the woman should, in every instance, receive due consideration. If the patient is very young, or of an age when there are usually no sexual propensities, it may be presumed that the discharge is the result purely of simple vaginitis, occasioned by want of cleanliness, the presence of worms in the lower bowel, derangement of the digestive apparatus, or an anemic state of the system. All vaginal discharges are acid, and intermixed with abraded epithelium; but neither the microscope, nor any chemical test at present known, is of any avail in determining whether they are of an ordinary or a contagious character.

The *treatment* of gonorrhœa in the female must be of a strictly antiphlogistic nature, until there is a marked diminution of discharge and local distress, when trial may be made of copaiba, or copaiba and cubebs, though, owing to the fact that the disease is rather a vulvo-vaginitis than a urethritis, these articles generally exert very little, if any, influence in controlling the morbid action. The patient should be confined to her bed, and, if plethoric, be freely bled at the arm, especially if the inflammation run very high, as denoted by the severity of the pain, and the sense of weight and fulness in the pelvic region, together with the profuseness of the profluvia. The venesection should be followed up by a brisk cathartic of the compound calomel pill, or an infusion of senna and sulphate of magnesia; and as soon as the bowels have been thoroughly relieved, recourse should be had to the antimonial and saline mixture, given every three or four hours, according to the exigencies of the case. The diet must be perfectly light and simple, as well as duly restricted in quantity.

The local treatment must be in strict consonance with the activity of the morbid action. If this be high, leeches must be applied in considerable numbers to the groins, vulva, and inside of the thighs; and in all cases the utmost attention must be paid to cleanliness by the frequent use of tepid ablutions and injections of tepid water, containing a little alum, soda, common salt, or acetate of lead. If the discharges be offensive, a small quantity of liquid chlorinated soda may be added to the water. Great care should be taken that the lotions, whatever be their composition, are not too strong, particularly at the commencement of the treatment, lest they should tend to increase the morbid action instead of diminishing it. Although stimulating injections are borne much better by the female organs of generation than by those of the male, yet there is no doubt that, unless well tempered, they often do immense mischief. Observation has taught me that it is impossible to pay too much attention to this subject. Another practical precept worthy of notice is that the inflammation will subside much more rapidly, other things being equal, when the affected surfaces are kept well separated, than when they are permitted to be constantly in contact with each other, the warmth and the accumulation of the matter thus occasioned having a tendency to maintain the disease in full vigor. To effect this object, a large tent of patent lint, wet with some gently astringent lotion, as a solution of sulphate of alum, or acetate of lead, should constantly be retained within the vagina, being changed from time to time, as cleanliness and other circumstances may render it necessary. When the inflammation has passed into the subacute or chronic state, the lotion may be dispensed with, and the tent smeared with the ointment of nitrate of mercury diluted with eight parts of simple cerate. Under the influence of this application, when the disease has reached this point, all discharge generally ceases in a few days. When ulcers exist upon the neck of the uterus, or upon the vulvo-vaginal mucous membrane, it may be necessary to touch them gently every third or fourth day with the solid nitrate of silver, or, what is preferable, with the dilute acid nitrate of mercury, the best formula being that of Bennet. The same rule, in regard to the continuance of the treatment, after all discharge has been arrested, should be observed here as in gonorrhœa of the male. The exhibition of copaiba and cubebs is indicated chiefly when the urethra is much implicated; for, as already intimated, the peculiar anti-gonorrhœal virtues of these articles do not display themselves at all when the disease is confined to the vulva, vagina, and uterus.

In uterine gonorrhœa, the proper plan is to detach the glairy mucus so liable to form in this complaint, several times a day, by means of a mop, or a mop and forceps, and to cauterize the canal of the neck of the womb, very gently, every forty-eight hours, with solid nitrate of silver. Injections of this substance, however weak, cannot be employed with safety, on account of their liability, at least in some cases, to enter the Fallopian tubes.

Abscesses are very apt to form in the labium, in the more severe forms of gonorrhœa, and should always claim early attention, as they are generally excessively painful, and are liable, when neglected, to occasion serious structural lesion. Their contents are usually excessively fetid, and of a thick, purulent character.

Buboes, arising during the course of the disease, are to be treated by rest, leeches, iodine, acetate of lead, and anodyne cataplasms. Matter is evacuated by an early and free incision. If the resulting ulcers and sinuses are long in healing, the knife and caustics must be used.

SECT. VII.—VESICO-VAGINAL FISTULES.

The bladder of the female is liable to various kinds of fistules, deriving their names from the organs with which they communicate, as vesico-vaginal, urethro-vaginal, vesico-uterine, vesico-utero-vaginal, and vesico-rectal.

The most common *cause* of this affection is the accidental laceration of the parts during parturition, in consequence of the pressure of the child's head, especially if the accoucheur has neglected to empty the bladder. It may also be produced, though, probably, less frequently than is generally imagined, by the maladroit use of instruments, inducing either direct rupture, or such an amount of contusion as to eventuate in gangrene and sloughing; by penetrating wounds of the vagina and bladder, and by ulceration, whether occasioned by abscess, simple, syphilitic, or malignant disease, or the pressure of a urinary calculus, a pessary, or any other foreign body.

The different classes of vesical fistules do not occur with equal frequency. Dr. Bozeman, who, as is well known, has paid much attention to the study of the subject, informs me that the examination of a large number of cases justifies him in stating that the vesico-utero-vaginal form of the lesion is decidedly the most common; next in point of frequency is the fistule established at the expense of the vesical trigone; then comes the opening situated at the bas-fond of the bladder; then the urethro-vaginal fistule; and, lastly, the fistule formed by the destruction of a part or the whole of the vesical trigone, and the wall of the urethra, of the trigone and bas-fond, or, finally, of all these parts together.

A great deal of diversity obtains in regard to the size, shape, and number of vesical fistules. Thus, the opening may not exceed the diameter of a small shot, or it may be so large as to admit a pullet's egg, or even a small orange. In its shape it is generally somewhat oval or circular, but occasionally it presents itself in the form of a transverse, oblique, or longitudinal rent, slit, or fissure. Its edges are usually well defined, rough, callous, and white, with a slight eversion of the vesical mucous membrane. The induration often extends a considerable distance beyond the fissure, especially when this has been caused by sloughing, and it is, therefore, occasionally very difficult to pare the edges of such an opening. The vagina in the neighborhood of the aperture may be perfectly sound, or it may be variously altered by disease, according to the nature of the exciting cause of the fistule, the violence of the resulting inflammation, and the acrid character of the discharges. It is not often that there is more than one opening.

A singular eversion of the bladder occasionally takes place in vesico-vaginal fistule, the lining membrane passing across the abnormal aperture so as to form a tumor in the vagina. The protrusion, which is seldom considerable, is generally of so trifling a nature as not to require any special attention. When, however, the artificial opening is unusually large, the whole bladder may project through it, and eventually even protrude at the vulva, as in the remarkable case mentioned in my Treatise on the Urinary Organs.

A female affected with vesico-vaginal fistule must necessarily be an object of the deepest commiseration. Incapable of controlling the contents of her bladder, the urine constantly escapes at the vagina, thus soiling her clothes, and giving rise to the most noisome odors, which no amount of cleanliness can entirely prevent. In consequence of this condition, she is rendered unfit for social enjoyment, and is obliged to spend her life in solitude and retirement. But this is not all: the urine, incessantly dribbling away, chafes and frets the parts with which it comes in contact, and thus renders them unfit for the exercise of their appropriate functions. The escape of urine is constant when the opening is situated at the bas-fond of the bladder, and is always worse in the erect than in the recumbent posture.

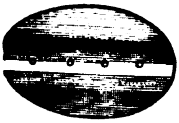
The *diagnosis* of this affection is in general sufficiently easy. In most cases, indeed, the escape of the urine by the vagina, instead of through the natural channel, serves at once to point out its true character, whatever may have been the nature of the exciting cause. Its situation, shape, and extent, however, can only be determined by a thorough vaginal examination by means of the speculum, the woman lying on her back, or, what is better, resting on her knees and forearms, with the head as dependent as possible, and the nates considerably elevated. The instrument, well oiled, is then introduced in the usual manner, a catheter being at the same time inserted into the urethra. In this way every portion of the vagina may be most satisfactorily inspected, and any opening, however small, easily detected. In some instances, the speculum is advantageously replaced by the finger, which is carried about in different directions, along the anterior wall of the tube, until its extremity comes in contact with the naked end of the catheter. When the aperture is very small, a long, slender probe should be used instead of the latter instrument.

The *prognosis* of vesico-vaginal fistule is, in general, anything but flattering. If a spontaneous cure does occasionally occur, the circumstance is so infrequent that it must always be regarded as an exceptional one. The probability of such an event will be considerably greater, other things being equal, when the accident has been produced by a simple wound than when it has been caused by a severe contusion, followed by a slough, when the opening is small than when it is large, and when the lesion is simple than when it is complicated. The presence of malignant disease forbids the hope even of temporary relief by any operation whatever.

Treatment.—The treatment of this affection is palliative and radical; the former consisting in the employment of such means as are adapted to promote the patient's temporary comfort, while the latter are designed to effect the permanent obliteration of the abnormal opening. Frequent ablutions and injections with cold water, either simple or medicated, and the occasional use of chlorinated soda, will prevent excoriations and noisome fetor, and a proper regulation of the diet, with a soluble condition of the bowels, will go far in preserving the general health, which, under opposite circumstances, sometimes suffers most severely, the patient becoming nervous, dyspeptic, and hysterical. To guard against the incessant escape of the urine, and enable the poor patient to exercise occasionally in the open air, the vagina should be kept constantly filled with a hollow plug, or caoutchouc bottle, enveloped in oiled silk, and furnished with a tube and stopcock, in order that it may be inflated or emptied at pleasure. Or, instead of this, a reservoir, such as that represented at p. 684, may be suspended from the vulva.

The radical treatment of vesical fistules has been brought to a high degree of perfection, almost exclusively by the labors of two practitioners, Dr. Sims and Dr. Bozeman, to the former of whom the great credit is deservedly due for having led the way in this most laudable enterprise. Previously to this, occasional cures had been effected by different American surgeons, especially by Hayward, Mettauer, and Pancoast.

Fig. 648.



Bozeman's button.

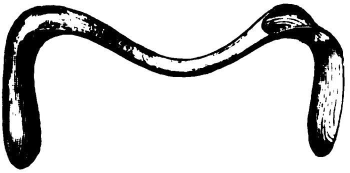
The operation of Dr. Sims was originally performed with silver wire, the ends of which were fastened with an ordinary shot, perforated at the centre. He accordingly called his suture the clamp-suture. For the shot Dr. Bozeman substituted a broad piece of sheet lead, generally of an oval shape, as seen in fig. 648, about a third of a line in thickness, pierced by several apertures, and variously bent, in order to adapt it accurately to the shape of the parts. Dr. Sims has of late years altogether abandoned the use of the clamp, and now limits himself to the employment of the wire suture. Dr. Bozeman, I believe, still operates with the aid of his button. I have myself effected excellent cures both with and without these aids, and am satisfied that the simple wire suture is, in the main, the very best that can be adopted. The button-suture may, however, be usefully employed in vesico-uterine and urethro-vaginal fistules, as it serves to support the edges of the fissure and thus prevents undue traction.

A certain amount of preliminary treatment is generally necessary. Indeed, without this precaution, failure, not success, will be likely to attend our efforts. The treatment need not be protracted, but it should be thorough, both as it respects the parts and the system at large. The most absolute recumbency and cleanliness should be observed; the vagina should be frequently syringed with cold water; cold cloths should be kept constantly upon the vulva; the bowels and secretions should be properly regulated; the diet should be perfectly plain and simple; and large quantities of demulcent drinks should be used to dilute the renal secretion, and to deprive it of its acrimony. Blood should be taken from the arm, or from the vulva, perineum, groins, and thighs, by means of leeches if decided plethora exists. If the parts are much inflamed, they should be gently touched, every other day, with the solid nitrate of silver, until the disease has measurably disappeared. Any contractions that may exist in the vagina must be thoroughly divided, care being, of course, taken, while this is being done, not to penetrate the bladder, rectum, or pelvic cavity.

When the neck of the uterus is imprisoned in the bladder, an effort must be made to reinstate it in its natural situation, as well as to relieve it of inflammation, before attempting to close the fistule. For this purpose, the cervix is drawn down by means of a blunt hook inserted into its mouth, at the same time that the fundus is dislodged from its position between the vagina and the rectum with a sponge mop, the woman, meanwhile, resting upon her knees and arms, so as to bring the parts fully into view. While held in this way, a tent, such as that described in a previous page, is introduced, renewal being afterwards effected twice a day, preceded by injections of cold water, until the organ is disposed to maintain its place.

The patient, freed from all bodily constriction, and thoroughly influenced by chloroform, is placed upon her abdomen, across an ordinary bed, protected with oil-cloth. The head and shoulders being depressed, the nates may be elevated to any desirable height, and the light so arranged as to fall directly

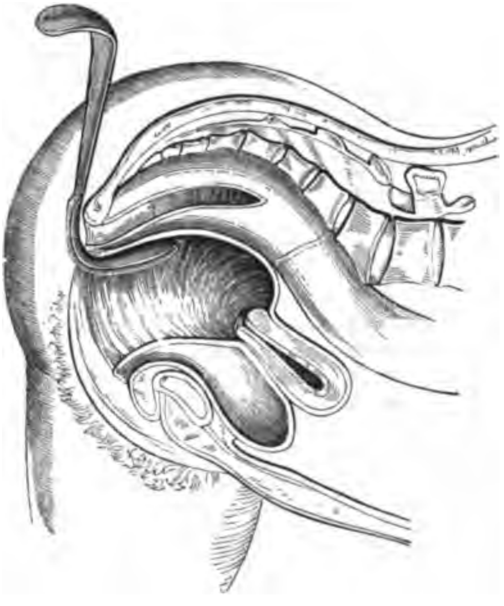
Fig. 649.



Bozeman's speculum.

upon the entire vesico-vaginal septum, the fistule, and the mouth of the uterus. The thighs are widely separated, and supported by assistants. The speculum of Dr. Bozeman, fig. 649, is now introduced, or the duck-bill speculum of Dr. Sims, of which, in the latter case, there should always be at least two sizes. Fig. 650 shows the application of the speculum, the position of the thigh and nates, the appearance of the dilated vagina, and the situation of the uterus, bladder, and vesico-vaginal septum. If the light should be insufficient, a small mirror may be used, the reflection of which will generally render everything perfectly distinct, and enable the operator to proceed without any embarrassment from this cause.

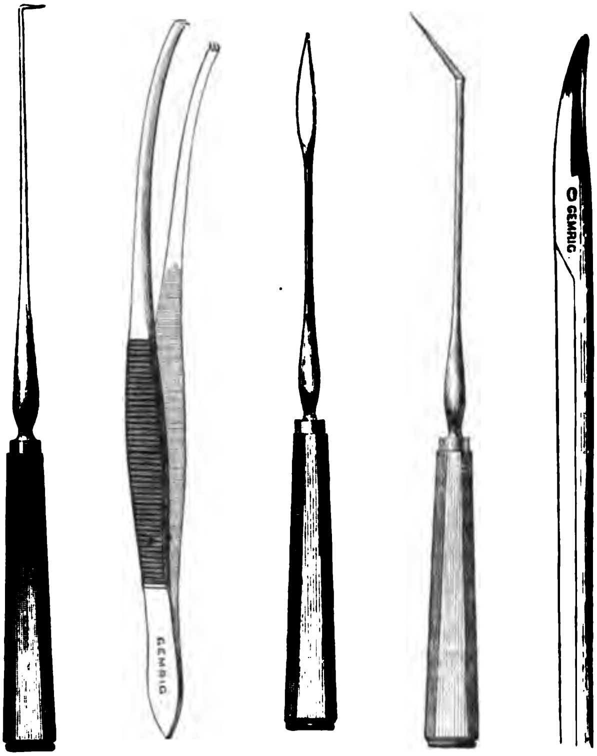
Fig. 650.



Position of the patient in the operation of vesico-vaginal fistule.

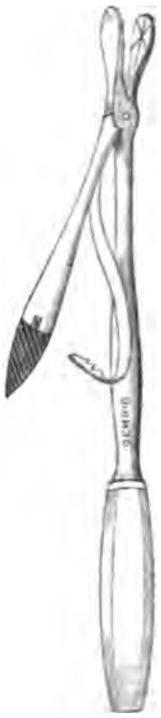
Everything being thus arranged, the surgeon pares the edges of the fistule, bevelling them off most thoroughly at the expense of the vaginal mucous membrane, at the same time that he carries his incision freely through the muscular and mucous coats of the bladder, so as to afford an ample surface for approximation and agglutination. It is impossible to lay too much stress upon the manner in which this part of the operation is performed. If the opening is circular, unusually large, or vertical, the edges should be sloped in such a way as to admit of being brought together transversely, otherwise complete union will be very difficult, if not impracticable. The instruments required for paring the fistule are, a delicate tenaculum, long, slender, toothed forceps, a straight and angular knife, and a pair of scissors, represented in figs. 651, 652, 653, 654, and 655. The scissors are provided with very short, sharp-pointed blades, slightly curved on the flat. The anterior border of the fistule is pared first, and this is done most easily with the straight knife, the necessary quantity of substance being excised in one piece. For refreshing the posterior margin, the curved knife or scissors will be found most convenient. When the opening is very large, this stage of the operation is sometimes impeded by the protrusion of the vesical mucous membrane, but the obstacle may usually be readily overcome by returning the part, and then filling the bladder temporarily with bits of sponge.

Fig. 651. Fig. 652. Fig. 653. Fig. 654. Fig. 655.



Instruments for vesico-vaginal fistule.

Fig. 656.



Needle-holder.

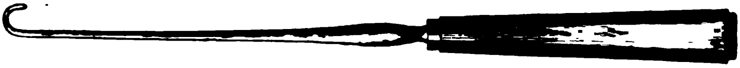
The next step of the operation consists in introducing the *sutures*, the number of which must necessarily vary according to the extent of the fistule. The instruments required for this purpose are several needles, a needle-holder, a pair of long, curved forceps, and a small hook.

The needles, commonly employed in this operation, are entirely too small and not sufficiently curved. They should be at least an inch and a half in length, stout, well-tempered, moderately curved, like the ordinary suture instrument, and very sharp at the point. Unless they possess these qualities, the operation will be attended with great vexation and delay, and it will be found to be extremely difficult, if not impossible, to take deep, firm, enduring stitches, a matter of paramount importance to success.

The best *needle-holder*, at all events the one which generally answers the purpose very well in my hands, is the instrument sketched in fig. 656. It needs no special description.

The first suture should be introduced at the centre of the fistule. The distance at which the needle is entered from its anterior edge should not be less than one-third of an inch, as the object is to obtain a very firm hold. The instrument is pushed

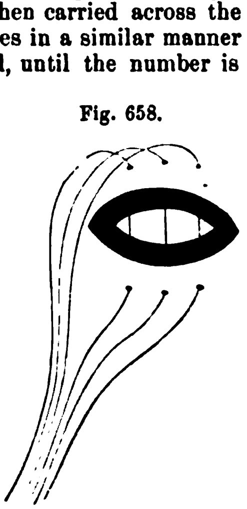
Fig. 657.



Hook for making counter-pressure.

steadily on, and brought out in the submucous cellular substance of the bladder, counter-pressure being made against its advancing point with a pair of forceps, or the little hook represented in fig. 657. The needle is then carried across the fissure, and entered at the posterior edge, which it traverses in a similar manner as the anterior. Thus suture after suture is introduced, until the number is completed, the interval between each two being about three-sixteenths of an inch, as exhibited in fig. 658.

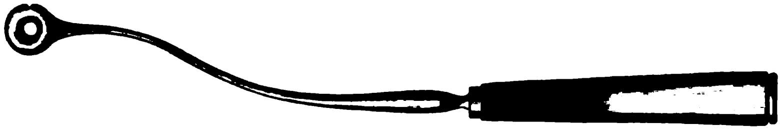
Fig. 658.



Application of the sutures.

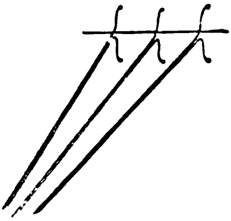
The closure of the fistules, and the arrangement of the shot or button, constitute the third stage of the operation. This is easily done with the aid of an *adjuster*, represented in fig. 659. It consists of a strong rod, curved in the shaft, and set into a handle, its distal extremity being perforated and somewhat bulbous. The opposite ends of each wire are now passed through the opening in the instrument, and firmly held between the thumb and forefinger of the left hand, when the adjuster is carefully slipped down, and well pressed against the parts. Fig. 660 shows the appearance of the parts after all the sutures have been adjusted, and the edges of the opening approximated. The operation is finished by firmly twisting together the ends of the sutures, and then cutting them off close to the fissure.

Fig. 659.



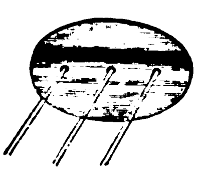
Suture-adjuster.

Fig. 660.



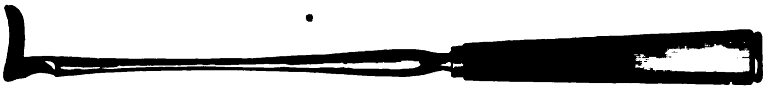
Appearances of the parts after the adjustment of the sutures.

Fig. 661.



Application of the button.

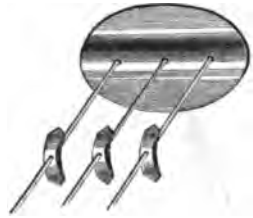
Fig. 662.



Instrument for securing the button.

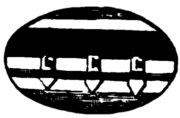
If the button is used, one of suitable shape and size is now selected, and passed over the wires, as seen in fig. 661; its concave surface corresponding to the vesico-vaginal septum, with which it is brought in close contact by means of the instrument represented in the annexed cut, fig. 662, the angular and scalloped extremity of which admirably adapts it for that object. The crotchet is now slipped down over the approximated ends of each suture, as illustrated in fig. 663, and pressed firmly against the convex surface of the button by means of a pair of forceps, to keep the button in place, and the edges of the wound thoroughly united. Finally, the operation is completed by clipping off the wires close to the crotchet, and turning down their short ends, as delineated in fig. 664.

Fig. 663.



Slipping down the crotchets.

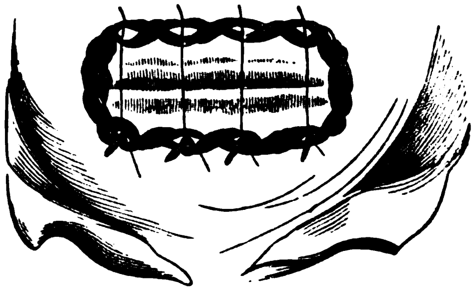
Fig. 664



Suture completely adjusted.

Instead of the button, Dr. Simpson employs a *wire splint*, alleging that it answers a better purpose for retaining the edges of the wound and supporting the sutures. It is made by twisting from fifteen to twenty threads of fine blue annealed iron wire into a cord, the ends being firmly plaited together, and the sides provided with a sufficient number of apertures for the passage of the sutures. The splint, the application of which is shown in the annexed cut, fig. 665, is very light, and easily moulded to the part at the time of the operation.

Fig. 665.



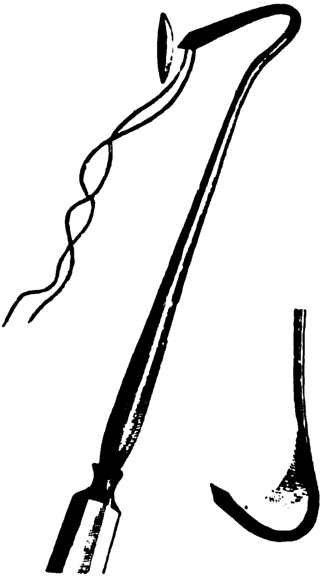
Simpson's iron-wire splint, properly adjusted and the ends of the stitches twisted and secured across the lower bar of the splint.

For passing the sutures, a great variety of instruments have been devised. Thus, Mr. Druitt has described one with a fish-hook curve, delineated in fig. 666, and which may, doubtless, be occasionally employed with advantage, though its application must, from its peculiar shape, be very limited. Dr. Simpson prefers a tubular needle, invented by Startin, and seen in fig. 667. The instrument is represented of full size, with the wire projecting at the end, which is a little thicker and larger than it ought to be. A part only of the handle is exhibited. The instrument which I myself employ for introducing the needle is a pair of slender forceps, straight, and very short in the blade, with a serrated surface. Nothing could possibly answer the purpose better, or be more simple.

For securing the sutures, the ends of the wire may simply be twisted with a pair of forceps; or the object may be effected with an instrument specially devised for the purpose, as that, for example, of Dr. Coghill, exhibited in fig. 668, reduced to one-half the proper size. Its extremity, as will be seen by reference to fig. 669, is furnished with two short lateral tubes, for the passage of the wire.

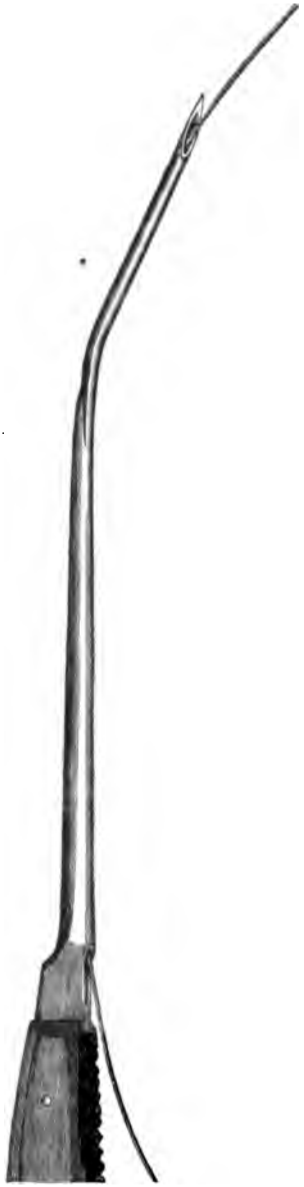
Certain *modifications* of this operation are frequently necessary, growing out of the situation of the fistule, or the condition of the parts. Thus, as Dr. Bozeman has so well pointed out, in the urethro-vaginal lesion, the button must be rather long in the antero-posterior direction, very concave, and extended well forward in front of the urinary meatus, so as to support the catheter, its extremity being somewhat notched. The edges of the opening are brought together transversely; and the catheter, a gum-elastic one, is introduced before the sutures are adjusted, and is retained, if possible, until the cure is completed.

Fig. 666.



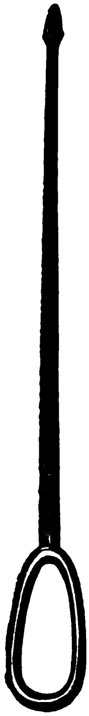
Druitt's suture needle.

Fig. 667.



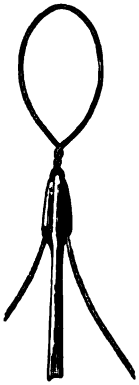
Startin's suture needle.

Fig. 668.



Coghill's wire twister.

Fig. 669.



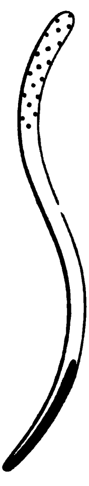
Extremity of wire twister.

In fistules involving the vesical trigone and the root of the urethra, or of the trigone and bas-fond, or of all these parts together, in which the anterior border of the opening is immovably fixed to the pubic arch, with the concavity presenting backwards, the button requires to be bent upon its convexity.

Considerable modification is required when the fistule extends into the neck of the uterus. The paring of the edges being effected in the usual manner, the button is carefully adapted to the shape of the parts, its posterior border being generally notched to accommodate the anterior lip of the cervix. A semicircular button is required when there has been so much loss of substance of the vesico-vaginal septum as to render it impossible to draw the anterior border of the fistule up to the posterior. The line of the perforations corresponds with the former border, while the notch in the button projects over the anterior lip of the neck of the uterus.

When the neck of the womb is lacerated, and buried in the bladder, the first object should be to restore the organ to its natural position in the vagina, in order that, after the cure is completed, the menstrual fluid may resume its natural outlet. To do this, it is necessary to enlarge the fistule in the vesico-vaginal septum on each side, transversely, thus disengaging the viscus somewhat, and affording more space for paring the anterior lip of the cervix. In inserting the sutures into the posterior border, the vesical mucous membrane is pierced by the needle, which, being carried into the bladder through the fistule, is entered far in on the vesical side of the cervix, and brought out from behind forwards, the object of the procedure being to obtain such a hold upon the womb as to enable the operator to pull its neck downwards and backwards during the adjustment of the sutures, restoration of the displaced organ being impracticable in any other way. The button for this variety of fistule requires to be bent upon its convexity, and to be notched above for the support of the anterior border of the neck of the uterus.

Fig. 670.



Sims's catheter.

During these various procedures, which must necessarily be more or less tedious and fatiguing, both to the patient and to the operator, great advantage will be derived from the use of several sponge mops, of various shapes and sizes, for wiping away the blood and the secretions. The bleeding is usually insignificant, and readily stops of its own accord, or under the application of ice-water. The operation being over, a Sims's catheter, fig. 670, is inserted into the bladder, a gum-elastic tube, about fifteen inches in length, having previously been secured to its outer extremity, in order to conduct the urine into a large bottle lying in a hollow between the patient's thighs.

After-treatment.—Much of the success of this operation, and, indeed, of every other of a similar kind, will depend upon the after-treatment. As soon as the patient is put to bed, she should take a large anodyne, for the twofold purpose of allaying pain and inducing quiescence of the bowels, which, in no case, should be disturbed under ten, twelve, or fifteen days. The diet should consist exclusively of potato, bread, crackers, custard, rice, and tea, with water as the common drink. Opium is given twice a day in as large doses as can be borne, and the patient is never permitted, even for a moment, or for any purpose whatever, to assume the erect posture, though she may, if she prefer it, lie on either side. The catheter is to be removed as often as may be necessary to keep it clear of blood, mucus, and calculous matter; once a day is generally sufficient. The vulva and orifice of the vagina should be syringed at least every twelve hours with tepid water, a large bed-pan being placed under the nates during the operation.

If any undue inflammation arises, leeches and even the lancet must be promptly called into requisition; purging is still carefully avoided, especially if there is no marked derangement of the digestive organs; and the utmost attention is paid to cleanliness. Both the part and system are occasionally endangered by erysipelas. In a patient under my charge several years ago, although more than usual care had been bestowed upon the preliminary treatment, a most violent attack of this disease took place within a few days after the operation, commencing on the right buttock, and gradually spreading over the upper part of the thigh, perineum, and vulva, from which it speedily extended into the vagina, causing large deposits of lymph, with a strong tendency to cohesion. The constitution suffered very much, and at one time I was not without serious apprehension in regard to the ultimate issue of the case. Notwithstanding all this, however, the woman made a good recovery, though several months elapsed before she fully regained her strength.

Peritonitis has occasionally occurred after this operation, and it is well enough always to have an eye to the possibility of such an event; so that, if it should show itself, it may be promptly combated. It rarely appears before the third day, or after the sixth or eighth.

Much stress has been laid in this operation upon the use of a Sims's catheter. I doubt, however, whether such an instrument is at all necessary; or whether, indeed, it may not even sometimes be hurtful, especially when the fistule is situated near the mouth of the urethra, as it may then press injuriously upon the sutures. However this may be, I have lately very advantageously dispensed with it in several cases, the urine being drawn off every six hours with an ordinary female catheter.

The sutures should not be removed, on an average, before the tenth day; if taken out sooner, the adhesions may give way, and thus necessitate a repetition of the operation. The patient being placed in the same position as in the first instance, the wires are clipped with a pair of curved scissors, and gently drawn away. Recumbency is observed for several days longer, and distension of the bladder is avoided until there is reason to believe that the new cicatrice is sufficiently strong to resist the pressure and traction of the surrounding parts. Any little apertures that may remain in the line of the sutures may usually be promptly closed with the aid of nitrate of silver.

The *statistics* of this operation are highly flattering. In a communication addressed to me in 1859, Dr. Bozeman informed me that he had operated altogether upon 33 patients, of whom 29 had been cured, 2 were still under treatment, 1 was incurable, and 1 had died. The whole number of fistules was 44, of which 40 had been completely closed, 3 had reopened after having been closed, and 1 had refused to unite. Of 43 fistules in 40 females, treated by Dr. Simon, of Rostock, 35 were entirely relieved, in 5 the union was imperfect, and 1 was a failure: 2 of the patients died. Of 42 cases reported by Dr. I. B. Brown, 39 recovered and 3 perished. We have thus an aggregate of 129 cases of the disease in 115 women, with 114 cures and 6 deaths.

SECT. VIII.—VESICO-RECTAL FISTULES.

A *vesico-rectal fistule* occasionally occurs as a result of wounds, ulceration, abscess, or malignant disease. The characteristic sign is an interchange of the contents of the two contiguous reservoirs, the urine passing into the bowel, and the feces into the bladder. Owing to this circumstance, the parts are sore and irritable, and the general health is more or less disordered in consequence. Moreover, the constant introduction of fecal and other matter into the bladder is liable to give rise to calculous concretions, and to retention of urine.

The more simple forms of this affection often disappear of their own accord. In all cases, the bowels should be maintained, for days together, in a perfectly quiescent state by morphia, opium, or laudanum, and the rectum should be washed out several times in the twenty-four hours with cold water, or, if the discharges are fetid, with a very weak solution of chlorinated soda. The recumbent posture should be carefully observed; the diet should be of the most bland and simple character; and drinks of every description should be used as sparingly as possible. As the case progresses, the closure of the fistule may often be greatly promoted by the constant retention of the catheter, which thus conducts off the urine as fast as it reaches the bladder, and, of course, prevents it from passing into the bowel.

If nature fails to accomplish her purpose, a cure may not unfrequently be effected by the use of nitrate of silver, acid nitrate of mercury, or the actual cautery, applied with the aid of an anal speculum. In very obstinate cases, especially when the abnormal opening is situated very low down, the edges may be pared, and united by suture, as in vesico-vaginal fistule. The anus should be widely dilated during the operation by means of blunt hooks. When this proceeding does not afford the requisite room, the best plan is to divide, as a preliminary step, the sphincter muscle.

Some years ago, I met with a case of *vesico-vagino-rectal* fistule, the patient being a woman, aged twenty-seven. The accident occurred during a protracted labor. For the first twelve months, the urine dribbled off constantly by the anus; but, after that period, she was able to retain it for half an hour, or even an hour, at a time, especially when in the erect posture. The rectum, which thus served the purpose of an accessory reservoir for the urine, was unusually tender and irritable, while the anus constantly exhibited an inflamed and excoriated appearance. The orifice of the urethra was natural, but all attempts to pass an instrument, even the smallest pocket-probe, proved abortive. Menstruation was performed with great regularity, though rather sparingly, at every lunar month, and the fluid, which was of the natural color, was discharged by the anus.

Finding it impossible to restore the vagina, I introduced a large curved trocar into the urethra, for the purpose of re-establishing the natural channel for the urine. The operation was performed without difficulty, the woman being under the influence of chloroform, and a self-retaining catheter was immediately inserted into the bladder. By wearing this, off and on, for several weeks, the passage was completely restored to its former size, the urine being discharged only five or six times in the twenty-four hours, and then always in a full stream. She had, in fact, the most thorough control over the bladder, the general health was excellent, and not a drop of urine escaped by the anus. The menstrual fluid also passed off by the bladder.

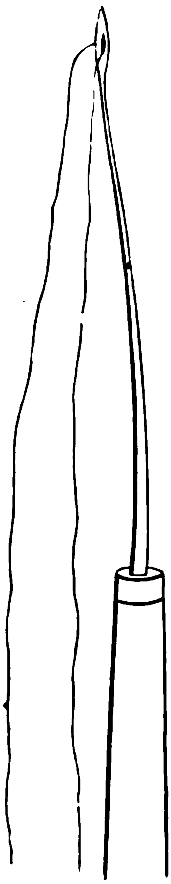
SECT. IX.—LACERATION OF THE PERINEUM.

Laceration of the perineum, usually a casualty of parturition, in consequence of the large size and rapid descent of the child's head, or the maladroit use of instruments, occurs in various degrees, from the slightest division of the skin and mucous tissues, to the union of the vagina and rectum into one cavity. In the latter case, there is, of course, more or less involvement of the recto-vaginal septum, the rent, perhaps, reaching up from six to eighteen lines. Owing to the laceration of the sphincter muscles of the anus, an accident which always necessarily attends the worst forms of the lesion, the woman has seldom any control over her bowels.

The *treatment* of this affection varies according to its extent and character. The more simple forms will generally promptly get well of their own accord, especially if proper care be bestowed upon them soon after their occurrence, in the way of rest, thorough approximation of the limbs, and cleanliness, assisted by light diet and constipation of the bowels. When the rent is extensive, recourse must be had to the quilled suture, the stitches being introduced very deep, and retained until there is a certainty of complete adhesion of the opposed surfaces. A similar plan of treatment is employed when the case has been neglected, but, in addition to this, it will be necessary, before arranging the ligatures, to see that the edges of the fissure are properly refreshed. This is usually easily done with the bistoury and forceps, aided with the scissors. The raw surfaces should not, on an average, be less than two inches in length by from nine to twelve lines in width. The borders of the recto-vaginal septum are also well pared, and carefully united, as a preliminary step, two stitches always sufficing for the purpose. In sewing up the perineal portion of the fissure, at least three ligatures will be necessary, the first being inserted at the verge of the anus, and the last at the base of the labia, through their substance. The hold should be very firm, otherwise there will be danger of premature separation.

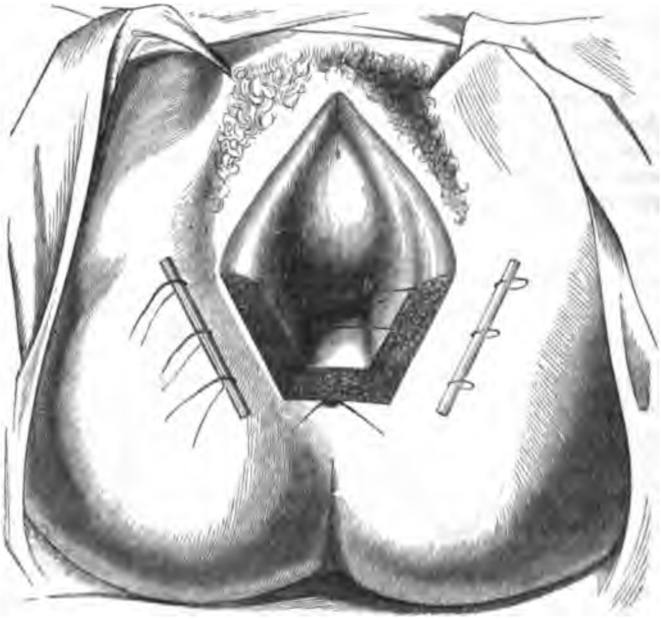
In performing the operation, the patient, brought fully under the influence of chloroform, is placed upon her back, as in the operation of lithotomy, the bowels having been thoroughly cleared out the night before. For sewing up the recto-vaginal septum the best instrument that I know of is the one represented at p. 484, in the section on staphylorraphy. The ligatures for the perineal fissure are readily introduced with the aid of the instrument depicted in fig. 671. The eyelet should be large, so that the thread may be easily reinserted above, after transfixion has been effected on the opposite side. The ends of the ligatures are then separated, and secured over two pieces of bougie, as seen in the adjoining sketch, fig. 672, from Mr. Brown. Should there be much tension, the operator may now divide the sphincter muscle of the anus, from an inch to an inch and a half exterior to this opening, the incision beginning about three lines in front of the coccyx, and extending some distance outwards and backwards, the gap being left to fill up by granulation. Such an expedient, however, will seldom be required; at all events, I have not myself been obliged to resort to it in any of my cases.

Fig. 671.



Needle for sewing up the perineum.

Fig. 672.

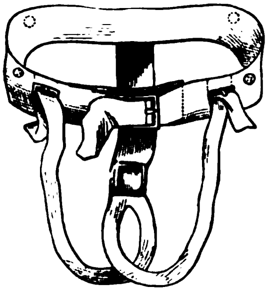


Laceration of the perineum.

The operation being over, the patient is placed in bed, her knees lying upon a pillow, and being tied together, to prevent any strain upon the perineum. Half a grain of morphia is at once given, in order to relieve pain and lock up the bowels, which should not be moved, if possible, for at least ten or twelve days. The diet should be as concentrated as possible, and, if there is any evidence of debility, a due allowance of brandy should be afforded. For the first three or four days, the cold water-dressing is used, and a syringeful of cold water is occasionally thrown into the vagina. The sutures should not, on an average, be disturbed under a fortnight, or until there is reason to believe that the union is perfect. Strict recumbency should be maintained for at least a week longer. The urine should be drawn off twice a day.

PERINEAL BANDAGE.

Fig. 673.



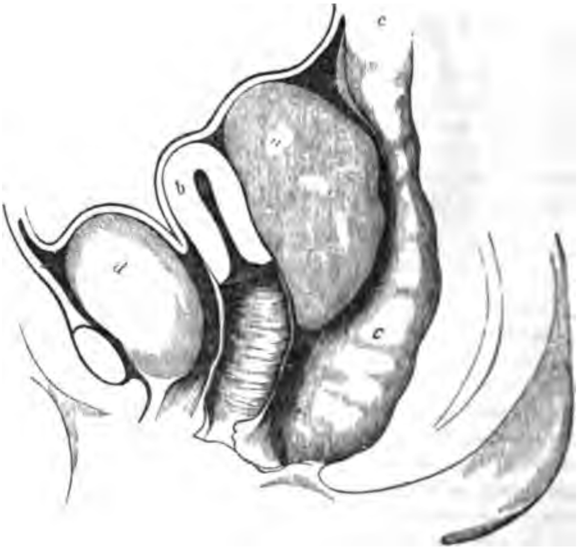
Perineal bandage.

Finally, it is necessary to add a few words respecting the perineal bandage, for retaining dressings upon the vulva, perineum, and anus, as well as for affording support in prolapse of the uterus and rectum. It consists, as the adjoining cut, fig. 673, sufficiently indicates, of two distinct pieces, a circular and a perpendicular, the former passing round the hips, and the latter over the perineum and vulva, where it is provided with a pad, covered with oiled silk. It is then split in two, each strip being brought up in front, and attached to the circular girth.

SECT. X.—RETRO-UTERINE HEMATOCELE.

A peculiar form of sanguineous tumor, first accurately described by Mons. Nélaton, is occasionally met with in the pelvis, the blood upon which it depends being poured out into the subperitoneal cellular substance of the neck of the uterus, from which it gravitates round the rectum and the upper extremity of the vagina, as shown in fig. 674. It usually takes place under the influence of inordinate straining during parturition, excessive sexual excitement, difficult menstruation, or external violence, and not unfrequently acquires such a bulk as to break through its confines into the peritoneal cavity. Generally, however, it is comparatively small, and eventually disappears through the agency of the absorbents. The disease, which bears the strongest resemblance to a thrombus of the vulva, is most common in females laboring under a varicose condition of the utero-pelvic veins, habitual constipation of the bowels, and morbid growths of the uterus and its appendages interfering with the free return of the blood.

Fig. 674.



Retro-uterine hematocele: *a*, representing the tumor; *b*, the uterus; *c*, the rectum; and *d*, the bladder.

The hemorrhage may proceed from different sources. Most commonly it is derived from the veins of the broad ligaments, or from the rupture of a Graafian vesicle during its extreme congestion at the menstrual period. It may also be caused by a reflux of blood from the uterus, as when the mouth of that organ is occluded by some obstruction; and cases have been recorded in which it emanated from injury of the Fallopian tube.

Age exerts an important influence upon its production. Of 34 cases analyzed by Voisin 20 were between twenty and thirty years old. I am not aware that it has ever been observed before the age of puberty. Its favorite period is evidently that of the greatest sexual vigor.

The *diagnosis* is generally obscure. The most reliable sign is the existence of a tumor at the sides and back of the neck of the womb, distinguishable by the finger in the vagina and rectum, free from pain, and the seat of more or less fluctuation, especially if the examination be made soon after the occurrence of the accident. The fundus of the uterus is generally tilted somewhat forwards towards the pubes, while the neck of the organ is inclined proportionately backwards, and sensibly diminished in length. The affections with which it is most liable to be confounded are, retroversion of the uterus, pelvic abscess, extra-uterine fœtation, and dropsy of the ovary; but from these it may usually be readily distinguished by the history of the case, the median position of the tumor, and the suddenness of the attack.

The *treatment* of retro-uterine hematocele is generally very simple; for, unless the tumor is of unusual bulk, it commonly soon disappears of its own accord, particularly if the woman is kept at rest in the recumbent posture, and upon light diet. If symptoms of inflammation arise, as indicated by pelvic pains and constitutional disturbance, recourse must be had to leeches, fomentations, purgatives, and other antiphlogistics. The sudden disappearance of the tumor, followed by great tenderness in the hypogastrium and depression of the vital powers, should lead to the suspicion of its rupture and the escape of its contents into the peritoneal cavity.

When the case is obstinate, refusing to yield to ordinary measures, the best plan is to evacuate the tumor with a large trocar, carried through the rectum or vagina, care being taken to wash out the sac well immediately after with tepid water, lest suppuration should occur. The canula, which should, as a general rule, be withdrawn, on the completion of the operation, may occasionally be advantageously used for breaking up the clotted blood, so as to promote its more easy escape.

SECT. XI.—PELVIC CELLULITIS.

The cellular substance of the pelvis, the broad ligaments of the uterus, and the recto-vaginal cul-de-sac is liable to inflammation, known as pelvic cellulitis. The phrase "pelvic abscess" is also very generally employed, as the inflammation not unfrequently terminates in suppuration. The disease, which is strictly of a phlegmonous character, often involves the uterine appendages, is not confined to any particular period of life, occurs both in single and in married females, though much more frequently in the latter than in the former, and is produced by a great variety of causes, among which the most common are external injury, as a blow, kick, or fall, and violence inflicted by the passage of the child's head in difficult labor. It may also be caused by excessive sexual intercourse, by suppression of the cutaneous perspiration, and by an extension of inflammation from the uterus, vagina, vulva, bladder, or rectum. The most common seat of the disease is the cellular substance of the pelvis. Lying-in females are its most frequent subjects. Of 61 cases observed by Dr. M'Clintock, of Dublin, nearly one-half occurred after the first labor.

The disease is generally ushered in by bold and well marked *symptoms*. The pain, at first dull and heavy, soon assumes a violent, throbbing, pulsatile character, and is always increased by motion and pressure; it generally begins low down in the pelvis, but as the disease proceeds it radiates about in different directions, and is often very severe in the iliac, supra-pubic, and anal regions. The whole hypogastrium is sometimes exquisitely tender. Gradually swelling sets in, easily detectable by the finger in the vagina and rectum, hard at first, but soft and fluctuating if the disease has made considerable progress. If the quantity of matter, upon which its presence mainly depends, is at all large, the tumor may encroach sufficiently upon the vagina, uterus and rectum to occasion serious displacement or obliquity of these parts. Not unfrequently a distinct swelling may be observed in the iliac region or in the lower portion of the hypogastric. Defecation and micturition are attended with more or less difficulty, progression is painful, if not impossible, and the woman, as she lies in bed, usually retracts her limbs to relieve the abdomen of its tension.

The attendant fever is variable. In general, it is well marked, with a distinct vesperal exacerbation; the pulse is hard, full, and frequent; the skin is hot and dry; the urine is scanty and high-colored; the appetite is impaired; the thirst is considerable; and the sleep is disturbed.

Although such is the course of events generally in this disease, cases not unfrequently occur in which its approaches are extremely stealthy and insidious. Instead of pain, there is, perhaps, merely a sense of uneasiness and fulness in the pelvic region; the general health is disordered, but there is no decided febrile disturbance; and the discovery of the swelling in the side, the vagina, or the rectum, may be purely accidental. When the attack is consequent upon parturition, the characteristic symptoms may not make their appearance under several weeks, or until the patient is considered as perfectly convalescent.

The matter that forms during the progress of the disease generally escapes, unless evacuated artificially, through the rectum, the vagina, or the colon. Occasionally it passes off externally, through the walls of the abdomen, and cases have occurred in which it burst into the bladder, the peritoneal cavity, and even into the uterus, as in the remarkable instances related by Dance and Wainright.

The *diagnosis* is generally sufficiently easy. The most important circumstances are, the history of the case, the peculiar situation and character of the pain, and the presence of a tumor, generally readily detectable by the finger in the vagina and rectum, or by the eye and finger, as when the matter points in the iliac region. The affections with which it is most liable to be confounded are, peritonitis and inflammation of the ovary, or ovary and uterus. It may also be simulated by neuralgia of the pelvic viscera. In case of doubt recourse must be had to the exploring needle. The formation of matter is sometimes indicated by rigors.

The *prognosis* is generally favorable, provided the case is properly managed. If it be misunderstood, the matter may escape into the abdominal cavity, and speedily destroy life by the induction of peritonitis. When the abscess is allowed to open spontaneously, great, if not irreparable, mischief may be occasioned by the burrowing of the pus, and by the establishment of numerous sinuses, opening, perhaps, into the vagina, the rectum, or even into the bladder.

The *treatment* is sufficiently obvious. The object, in the early stage of the disease, is to prevent the formation of matter, and this is usually most readily attained by the vigorous employment of antiphlogistic measures, especially rest in the recumbent posture, the application of leeches to the perineum, vulva, and hypogastrium, and medicated fomentations. If the patient is strong and plethoric, blood should be freely taken from the arm, and the system rapidly brought under the full influence of the antimonial and saline mixture. The lower bowel should be emptied with enemata, but active purging must be avoided, as it would tend to irritate the affected parts. A laudanum injection generally affords great relief. As soon as the abscess points, a large opening must be made into it, if possible, at its most dependent portion, to afford free vent to the pent-up fluid, which should on no account be permitted to burrow, otherwise troublesome, if not incurable, sinuses and fistules will be sure to follow. When the abscess discharges itself spontaneously, it will be well, as a general rule, to enlarge the aperture with the probe-pointed bistoury, in order that the matter may escape as fast as it is formed. Cleanliness is promoted by the frequent use of the syringe and tepid water, impregnated with chlorinated soda. The cure is often tedious. If the system is much exhausted, the patient will require change of air, tonics, and a full share of alcoholic stimulants.

SECT. XII.—AFFECTIONS OF THE MAMMARY GLAND.

The mamma is liable to inflammation, abscess, hypertrophy, neuralgia, and various kinds of tumors, both innocent and malignant. The latter, in fact, appear to have a kind of pre-emption right to this organ.

MAMMITIS.

Inflammation of the breast, technically termed mammitis, is chiefly observed during lactation, in consequence of suppression of the cutaneous perspiration, or retention of the milk, causing over-distension of the lactiferous ducts. It may also arise from too free living, neglect of the bowels and secretions, and from the effects of external violence. It generally comes on within the first fortnight after parturition, beginning in the form of one or more ovoidal lobules, hard and tender to the touch, somewhat deep-seated, and not exceeding the volume of an almond. As the inflammation progresses, other lumps appear, and, gradually coalescing, at length involve the whole breast, glandular structure and connective tissue as well. The organ is now exceedingly large, hard, and heavy, exquisitely painful, and intolerant both of manipulation and pressure. The skin is hot, discolored, tense, and glossy, pitting, perhaps, here and there slightly under the finger. The secretion of milk is either arrested, or, at all events, much diminished, and great difficulty is experienced in emptying the organ, the choked-up ducts being seemingly indisposed to part with their contents. Well-marked constitutional symptoms are always present at this stage of the disease. The patient is hot and feverish, or alternately hot and chilly, the tongue is dry and coated, the pulse is full and frequent, the bowels are constipated, and the urine is scanty, high-colored, and loaded with urates. If permitted to go on, the inflammation soon passes into suppuration, the event being announced by the ordinary local and constitutional phenomena, especially throbbing, an erysipelatous blush of the skin, and rigors alternating with flushes of heat.

The *treatment* of acute mammitis must be conducted upon strictly antiphlogistic principles, early and vigorously enforced. If the patient is very plethoric, blood is taken from the arm, or by leeches from the seat of the disease, the bowels are moved by active purgatives, vascular action is controlled by the antimonial and saline mixture in combination with aconite or veratrum, and the lightest possible diet is enjoined, with an avoidance of fluids of every description, thirst being allayed by the use of ice. The breast must be well supported with an appropriate bandage, and the surface kept constantly wet with warm water-dressing, medicated with acetate of lead and laudanum. If suppuration be threatened, an emollient poultice, if not too heavy, will generally be found to be very grateful. Pain is allayed by anodynes, conjoined with diaphoretics, especially if there is dryness of the skin. The breast should be relieved at least twice a day of milk, either by suction with the mouth or a suitable pump, the child receiving its nourishment from the sound organ.

A speedy check may often be put to an incipient mammitis by rubbing the affected organ thoroughly several times a day with warm oil and laudanum, or mild ammoniated liniment, the friction being made in the direction of the lactiferous ducts, that is, from above downwards towards the nipple, by the nurse, as she stands behind the patient, and supports the posterior surface of the breast with one of her hands. This mode of treatment, which is particularly insisted upon by Dr. S. C. Foster, of New York, generally exerts a powerful effect upon the indurated gland, softening it in a short time, reducing the swelling, and promoting the flow of milk.

When the disease has lost its acute character, sorbefacient liniments and unguents may advantageously be employed; or, what is often much better, strapping of the breast with adhesive plaster, on the same principle as in chronic inflammation of the testicle. Each strip should be three-fourths of an inch in width, and long enough to extend once and about a third around the organ, the application being commenced at the base, and continued by circular and vertical turns, until the whole is completely enveloped, a suitable opening being of course left for the nipple. The dressing will require renewal about every forty-eight hours.

The local treatment in these chronic cases will generally be immensely promoted by a properly regulated diet, and by an occasional cathartic of blue mass and colocynth, or black draught.

ABSCESS.

When mammitis passes into suppuration, the matter always collects in the form of an abscess, which may be situated either in the interlobular substance of the gland, in the cellulo-adipose tissue beneath the skin, or in the connective substance behind the organ, the frequency of the occurrence being in the order here stated. The symptoms denotive of the event are, an increase of pain, which is throbbing, deep-seated, and continued, a dusky or purplish appearance of the skin, a sense of fluctuation, especially if the matter has already accumulated in considerable quantity, and rigors or chilly feelings, alternating with flushes of heat, and followed by copious sweats. When the pus is situated at an unusual depth, its presence is often indicated by an œdematous state of the subcutaneous cellular tissue.

The matter which is formed in this disease is generally of a thick, cream-like consistence, and of a whitish or pale yellowish color. When the inflammation has been very high, it is apt to contain flakes of lymph and pure blood, the latter being usually in a state of coagulation. Milk is almost always a prominent ingredient. Even when it exists in so small a quantity as to be undiscoverable by the naked eye, its presence may, in general, be readily detected by the aid of the microscope. The quantity of pus varies from a few ounces to upwards of a quart, the average being from four to eight ounces. From a week to a fortnight is the time required by the abscess to work its way to the surface.

The *treatment* of mammary abscess consists in an early and free incision, for the twofold purpose of relieving pain and saving structure. The edges of the wound are prevented from closing by the use of the tent. The most suitable application for the first few days is an emollient poultice, or the warm-water-dressing. All rude squeezing, with a view of promoting the evacuation of the pus, must be avoided, as it is calculated not only to produce pain, but to aggravate inflammation.

When the treatment of mammary abscess has been neglected, or mismanaged, the matter is extremely apt to burrow, dissecting the lobules of the glands from each other, and also, in many cases, from the surrounding parts, thus causing extensive havoc, and the formation of numerous sinuses; sometimes as many, perhaps, as half a dozen. Such cases are always attended with great suffering, both local and constitutional. Until lately, the treatment used to be as cruel as it was generally tedious and unsatisfactory, the object being to trace out the passages with the director and knife, with a view, as was alleged, of healing them from the bottom, a tent being maintained in them for the purpose. Within the last few years, a more scientific mode of management has been extensively pursued in this country, in consequence of the recommendation of Dr. Foster. It consists simply in the application of compressed sponge, confined by means of an appropriate bandage, aided by a suitable diet, and attention to the bowels. The sponge, freed of dirt, perfectly soft, elastic, and large enough to cover the entire breast, is thoroughly dried, and then effectually compressed by keeping it for twenty-four hours under a heavy weight, as, for exemple, a common letter copying-press. Thus prepared, it is bound upon the affected organ over a piece of patent lint, to prevent irritation of the skin, by means of a roller passed several times round the chest, above and below the sound breast. It is then saturated with tepid water, which has the effect of expanding it towards the diseased structures, pressing the walls of the sinuses together, and at the same time forcing out their contents and absorbing them. The sponge is changed once in the twenty-four hours. A little pain generally attends the first application, but this usually disappears in fifteen or twenty minutes, and does not recur afterwards. The improvement under this treatment is most rapid, the worst cases generally recovering in a few weeks. If the general health is much impaired, it should be conjoined with the use of tonics, a nourishing diet, and exercise in the open air. The organ, after recovery, may be allowed to remain inactive, or suckling may be resumed, if it should be deemed necessary.

In my own practice, I have usually succeeded, without difficulty, in relieving such cases by systematic compression with adhesive strips, or, what is better, with strips of ammoniac and mercurial plaster, applied quite firmly, and in such a manner as not to interfere with the discharges. Indeed, I have often effected excellent cures simply by wrapping up the breast in the plaster, without cutting it into strips.

The *chronic abscess* of the breast is often a very troublesome and annoying affection, the more so because of the difficulty occasionally experienced in the diagnosis. I have repeatedly had patients sent to me from a great distance under the supposition that they were laboring under malignant disease of the mamma, when their only ailment was a chronic abscess. What is still worse is that the organ has occasionally been extirpated in such cases, as I have myself known it to be in two instances. Such stupidity cannot be too severely reprehended, especially as there is not the slightest excuse for it, the use of the exploring needle always promptly revealing the true nature of the disease.

It is probable that the chronic mammary abscess is occasionally of a strumous nature, especially when it attacks, as I have known it to do in several instances, young, unmarried females; but, in general, it will be found to be the result of ordinary inflammation, occurring during suckling, and proceeding in a very slow and stealthy manner, in consequence of some defect in the constitution, or of some obstruction in the lactiferous ducts. In most cases the disease takes place in the breast which the child has been unable to use on account of a sore or retracted nipple. Sometimes the exciting cause is a blow or contusion, perhaps so trivial as not to attract any attention at the moment.

The disease usually begins in the form of several hard lumps, which, gradually coalescing, at length unite into one solid mass, of irregular shape, and of firm consistence; sometimes involving only a portion of the breast, and at other times the entire organ. Occasionally the glandular structure escapes completely, the morbid action being confined exclusively to the cellular tissue around, behind, or in front of the breast. By and by, a process of softening begins, and, steadily progressing, a large accumulation of pus occurs, pressing upon the parts in every direction, and fluctuating distinctly under the finger. Marked enlargement of the subcutaneous veins usually attends, especially when the disease is of long standing, but there is no discoloration of the skin, and seldom any severe pain; merely, perhaps, a sense of weight and of uneasiness. The general health is not materially affected, and there is no involvement of the surrounding lymphatic ganglions. The disease may last for months.

The *treatment* of chronic mammary abscess is by evacuation, and support of the breast by the ammoniac and mercurial plaster, aided by compress and bandage. Unless this precaution is used, there will be danger of hemorrhage from the rupture of the weakened vessels of the walls of the abscess. In a case communicated to me by Dr. Walter, of Nazareth, bleeding came on a week after opening a large swelling of this kind, and was so copious as almost to exhaust the patient. It was at length checked by the pressure of a common spring truss. When the matter has been evacuated, recovery will be promoted by attention to the diet and bowels, by exercise in the open air, and by the use of tonics and alterants. The cure is generally perfect.

GANGRENE.

The mammary gland is singularly exempt from gangrene. Such an occurrence, indeed, is possible only in very unhealthy females, or in women who, in addition to scrofulous or syphilitic disease, are suffering, at the time of the inflammatory seizure, under an impoverished state of the blood. A few cases are upon record where gangrene of this gland was occasioned, in middle-[illegible] the protracted use of ergot. In erysipelas and carbuncle the [illegible] around the gland sometimes mortifies, the mamma itself generally [illegible] treatment of this affection, however induced, is to be conducted in [illegible] ner as in gangrene in other parts of the body, and, therefore, does [illegible] any special notice.

SORE NIPPLES.

Women, during their confinement, particularly if it be a first one, are [illegible] liable to suffer from inflammation of the nipple, speedily terminating [illegible] tion. The sores have generally the appearance of superficial fissures [illegible] abrasions, attended with a thin, serous, or sero-sanguinolent discharge [illegible] cessive pain, usually of an itching, smarting character. Occasionally [illegible] tion extends to a great depth, partially separating the nipple from [illegible] and thus greatly augmenting the suffering. The affected parts are [illegible] inflamed, the breast feels tender and hard from the accumulation of [illegible] sebaceous follicles around the nipple are irritated and sensibly enlarged [illegible] disease usually appears within the first few days after delivery, in [illegible] of the application of the child's mouth, which never fails to aggravate [illegible]

The *treatment* consists in the application of collodion, in thorough[illegible] the breast at least three times a day with the pump, and in the use [illegible] purgative, along with a light, dry diet, the object being a partial [illegible] the milk. If both nipples are affected, the child should be [illegible] through the medium of a heifer's teat, until the parts are cicatrized. [illegible] as well as afterwards, they should be carefully protected from the [illegible] clothes, by means of an appropriate glass.

When collodion fails to afford relief, various astringent remedies may [illegible] ployed, as weak solutions of alum, zinc, or copper, in union with tannin [illegible] of silver, in the proportion of two grains to the ounce of water [illegible] answers a good purpose. Yellow wash, prepared with one-fourth of a [illegible] bichloride of mercury to the ounce of water, makes an excellent [illegible] superficial chaps of the nipple, but caution must be observed in its use [illegible] sionally nothing affords such prompt relief as the ointment of the nitrate [illegible] cury, diluted with six or eight times its weight of lard. A strong [illegible] borax, thickened with brown sugar, and rendered stimulating with [illegible] favorite domestic remedy, from which I have frequently derived great [illegible]

In most cases, the foundation of this disease is laid during pregnancy [illegible] a want of proper attention to the parts. In general, all difficulty may [illegible] cessfully prevented by the avoidance of pressure, and the use of some [illegible] wash, as alum and tannin, for the purpose of hardening the nipples.

The nipple is often very short, imperfectly developed, or flat and [illegible] much to the annoyance both of the mother and child. Numerous plans have [illegible] suggested for raising it when thus affected, but there is, perhaps, none [illegible] as the application of a large bottle with a long neck, in which the air has [illegible] rarefied with hot water. The water having been poured out, and the [illegible] the bottle placed over the nipple, a vacuum is formed as the bottle cools [illegible] thus establishes a powerful and equable suction, thereby effectually [illegible] the parts without any serious inconvenience to the mother. Most of the [illegible] tubes and pumps, properly so called, do more harm than good in these [illegible] the nipple. This treatment may often be advantageously employed [illegible] last six or eight weeks of pregnancy, so that the nipple may be [illegible] veloped by the time of birth.

NEURALGIA.

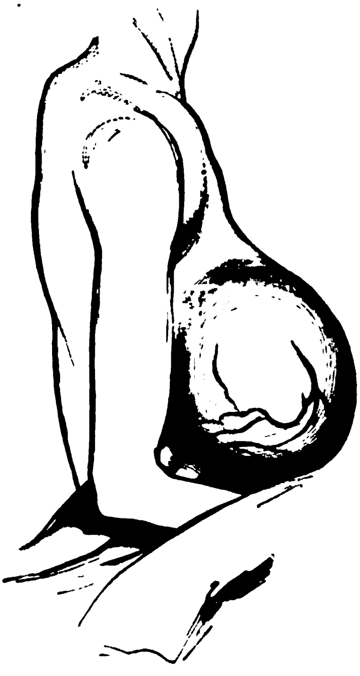
Neuralgia of the breast may occur at any period after puberty, but is [illegible] common in young females from the age of fifteen to thirty. It is [illegible] by exquisite pain, darting through the part like electricity, and extending [illegible] rally to the corresponding shoulder and axilla, and sometimes down the [illegible] the fingers. The suffering, which resembles that of tic douloureux, and [illegible] often observes a regular periodicity, is very much increased prior to menstruation, and is sometimes so severe that the patient is unable to lie upon the affected side, or bear the weight of the bedclothes. The disease, which may last for years, is met with mostly in persons of a nervous, irritable temperament, with deficient menstrual secretion.

The morbid action is commonly confined to several of the mammary lobules, which either retain their natural bulk and appearance, or, what is more common, they are converted into small, solid tumors, distinctly circumscribed, movable, and highly sensitive to the touch. Occasionally these swellings seem to be seated in the connecting cellular tissue rather than in the glandular structure; they seldom exceed the size of a marble, an almond, or a walnut; they never suppurate, and they sometimes disappear spontaneously.

More or less disorder of the general health usually attends; the patient looks pale and thin, is remarkably susceptible to atmospheric impressions, and nearly always suffers under marked derangement of the menstrual function, the discharge being unusually scanty, and accompanied with a great deal of pain. In most of the cases that have fallen under my observation, the disease was associated with neuralgia in other parts of the body.

The *treatment* is to be conducted upon ordinary anti-neuralgic principles. The general health having been amended by a proper regulation of the diet and the use of purgatives, the patient is placed under the influence of quinine, or, if there is evidence of anemia, quinine and iron, in union with arsenic, strychnia, and aconite, cannabis Indica, or stramonium, steadily and persistently continued, with an occasional intermission, until a decided impression has been made upon the complaint. Sometimes the exhibition of colchicum and morphia proves highly beneficial; and I have seen cases in which nothing appeared to answer so well as the antimonial and saline mixture, with aconite. The most suitable local remedies are anodyne liniments and plasters, preceded, if there is considerable tenderness and swelling, by leeching. The breast must be well supported and protected from pressure. The menstrual function must receive due attention.

Fig. 675.



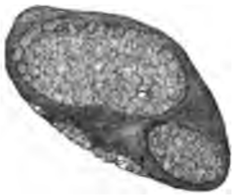
Hypertrophy of the mammary gland.

HYPERTROPHY.

Hypertrophy of the mamma presents itself in two varieties of form, the general and the partial, or the lobular, as it is now usually termed. General hypertrophy, fig. 675, is not uncommon, nor is it, as might be supposed, confined entirely to the female sex. I have repeatedly seen both breasts of the male enlarged many times beyond their normal bulk, and not a few cases are recorded where they freely, and, for a long time, secreted milk. In women the swelling is commonly associated with amenorrhœa: it sometimes occurs during pregnancy, and disappears soon after delivery. Occasionally the affection begins at an early period of life, and goes on progressively increasing until the breast acquires an enormous bulk. Of this, an interesting case came under my observation in 1857, in a colored girl, nearly seventeen years of age, a patient of Dr. Hanly, of this city. The hypertrophy involved both organs, but not in an equal degree, the right being more than twice the volume of the left, and weighing, by estimate, upwards of fifteen pounds, its length exceeding fifteen inches. They were of a very firm consistence, considerably nodulated, and quite tender on manipulation. The subcutaneous veins were enormously enlarged. The hypertrophy had commenced without any assignable cause, when the girl was twelve years of age. When I first saw her, she had been confined a fortnight, and I was informed that her breasts had much increased in size both during and since her pregnancy. Her general health had become much impaired, and she was excessively emaciated. Dorsten gives a case of this kind, in which the left breast weighed sixty-four pounds.

The true nature of this disease is not determined. In some cases the affected organ retains its normal structure, at least apparently so; whereas in others it is materially altered, being preternaturally dense and firm, and deprived of its glandular character. The interlobular cellular tissue is much augmented in quantity, and similar changes are generally witnessed in the cellulo-fatty substance surrounding the organ. Occasionally the enlargement is associated with retention of the milk.

Fig. 676.



Lobular hypertrophy of the mamma.

Partial hypertrophy of this gland, fig. 676, is most common in young, nervous, irritable females, and usually presents itself as a small tumor, either solitary or multiple, in structure closely resembling the ordinary mammary tissue. It is lobulated, granular in appearance, of a white, pink, or red color, tolerably firm in its consistence, and invested by a cellulo-fibrous envelop continuous with the proper fascia of the gland. The growth is traversed by milk ducts, and is capable, if unmolested, of acquiring the bulk of a fist, or even of an adult's head. Its minute structure may be resolved into numerous lobules, connected by common areolar tissue, in a state of condensation.

The *treatment* of mammary hypertrophy is generally conducted upon empirical principles. The use of sorbefacients would necessarily suggest itself in such a disease, but it does not appear that it has hitherto been of any marked benefit. The most suitable article would be iodine, administered internally, and applied to the affected organ, either in the form of tincture or of ointment. Gentle and protracted ptyalism might be serviceable. Occasionally benefit has accrued from the steady and persistent exhibition of hydrochlorate of ammonia, in doses of ten to twenty grains, thrice a day. Whatever remedies be employed, special attention should be paid to the improvement of the general health, which is often much impaired. The breast should be well supported, to take off weight and tension. Strapping the organ carefully with ammoniac and mercurial plaster would probably exert a more powerful sorbefacient influence than any other local means, though I am not aware that it has ever been fairly tested. Extirpation should be resorted to when the tumor, refusing to yield to treatment, is so large as to cause severe suffering and inconvenience, gradually, but effectually, undermining the general health.

The lobular form of the affection often readily yields to a mild alterative course of treatment, with an occasional mercurial purge, aided by sorbefacient liniments, unguents, and plasters. Leeching frequently proves highly beneficial. Extirpation is resorted to when the tumor is large or intractable.

ATROPHY.

Atrophy of the mamma is a natural effect of old age. When the menstrual function ceases, the gland begins to diminish in volume, and the wasting gradually progresses, until, at length, the whole organ is reduced to a soft flabby mass, of a dirty, grayish tint, in which it is often difficult to detect any of the natural structure, except the lactiferous ducts, which are seldom completely effaced. Sometimes the gland shrinks early in life, particularly in married females who do not nurse their offspring. Atrophy of this viscus occasionally results from the effects of neuralgia, and the use of certain medicines, as iodine and hemlock.

The lesion presents little of surgical interest. When it occurs in young females, as a consequence of the use of medicines, neuralgia, or habitual pressure, immediate measures should be adopted for its arrest, otherwise the organ may be irretrievably lost.

FISTULE.

During lactation, a galactophorous duct is sometimes included in a wound of the breast, and, unless the edges of the integuments are very closely approximated, a lacteal fistule may remain. The same consequences may be produced by a rupture of the canal from the inordinate accumulation of milk. A more common occurrence is the formation of accidental outlets, from the irritation of multilocular abscesses. These passages are often of considerable depth, tortuous, numerous, lined by an adventitious membrane, and attended with a great deal of induration of the surrounding parts.

The disease will usually disappear of its own accord, as soon as lactation is over, and frequently even long before that event. If the case is troublesome, a cure should be attempted by the application of compressed sponge, conjoined, if necessary, with stimulating injections.

CALCAREOUS CONCRETIONS.

Calcareous concretions are met with in the breast, either in its substance or in the lactiferous ducts; they are commonly small, not exceeding an ordinary pea, and are observed chiefly in connection with fibrous and other tumors. I have seen these bodies only in two instances, in females far advanced in life. They were of a whitish color, irregularly spherical in shape, and of a hard, solid consistence, like dry mortar. A case has been described by Berard, in which the outer portion of the mamma was converted into a complete osseous shell.

Unless these concretions prove a source of inconvenience or annoyance, they should be let alone, especially if the patient has not passed the child-bearing period, as an operation might be attended with serious injury to the lactiferous tubes.

APOPLEXY.

The breast is liable to apoplexy, consisting in an effusion of blood into the connecting cellular tissue, resembling an ecchymosis produced by a blow or leech-bite. Generally there is only one such spot, but there may be several, coming on a few days before the menstrual period, and disappearing within the first week or two after; though sometimes they continue for more than a month. The disease seems to depend upon some sympathetic action between the uterus and the breast, causing a great determination of blood to the latter, eventuating in the rupture of some of its smaller vessels. The affected parts are always of a dark, livid hue, and are exquisitely tender on pressure, the pain sometimes shooting down to the ends of the fingers.

The *treatment* of this affection consists in sorbefacient applications, especially if some time has elapsed since its occurrence. When the effusion is recent, it will generally promptly disappear under cold saturnine and opiate lotions.

BENIGN TUMORS.

Under this head may be included various kinds of growths of a benign or non-malignant character, as the sero-cystic, hydatic, lacteal, and adenoid.

1. SERO-CYSTIC TUMORS.

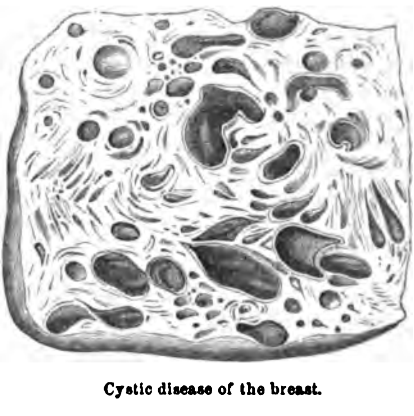
Tumors of the breast, containing serous cysts, are sometimes met with; chiefly in married females between the twentieth and fortieth years. The disease, constituting what was formerly called cystic sarcoma, is strictly of a benign character, and it never recurs after thorough removal. Its progress, always very tardy, is seldom attended with any decided disorder of the general health, the chief inconvenience caused by the morbid growth arising from its weight and bulk, which are sometimes enormous. How the affection originates is unknown. It usually begins in the interlobular cellular tissue of the gland, which, as the disease advances, is completely annihilated.

Two distinct forms of cystic disease of the breast are met with, the unilocular and the multilocular. In the former, the cyst, as the name implies, is single, and composed of a membrane which bears a very close resemblance to the peritoneum, its inner surface being perfectly smooth and glossy, while the outer is intimately connected to the surrounding parts by short, cellulo-fibrous tissue. Occasionally the cyst is intersected by membranous bands, separating it into a number of distinct compartments, of varying size and shape. When this is the case, the cyst is said to be *multilocular*. Various fluids are found in these sacs. Generally they are of a serous nature, more or less viscid, coagulable, of a saline taste, and of a limpid, or pale yellowish appearance; but cases occur in which they are of a reddish, olive, brownish, claret, or blackish hue. Not long ago, I saw an instance in which the fluid was of the color of the tincture of iodine. Sometimes, again, it is of a lactescent nature, whey-like, or muco-albuminous. Finally, there are cases, although they are rare, in which it contains cholesterine, flakes of lymph, and other substances.

Cysts of the character now described often attain a large bulk, being capable of holding from twenty to sixty ounces of fluid.

Very frequently, again, the cysts are *multiple*, their number, perhaps, ranging from a few dozens to many hundred. When this is the case, they are generally very small, their volume varying from that of a hemp-seed to that of a pigeon's egg. Their shape is usually spherical, ovoidal, or conical. When young, they are smooth, transparent, elastic, vascular, closely adherent, and filled with a clear, watery fluid, slightly saline in its taste, and scarcely coagulable by heat, alcohol, or acid. Their parietes, however, are liable to become opaque and thickened, from the effects of inflammation, and the same cause generally induces remarkable changes in the contained fluid, which may be lactescent, bloody, oleaginous, glairy, or gelatinous. Different cells of the same tumor often have dissimilar contents. The morbid mass is sometimes entirely composed of cysts; at other times a considerable proportion of solid matter is interposed between them, commonly of a tough, cellulo-fibrous nature. The characters of the multiple form of this disease are well seen in fig. 677, from a preparation in my cabinet.

Fig. 677.



Cystic disease of the breast.

The *diagnosis* of this malady is often obscure, especially in its earlier stages. The chief signs of distinction are, the gradual and steady growth of the tumor, the absence of pain and of lymphatic involvement, a sense of fluctuation, more distinct at some points than at others, the natural appearance of the integuments, and the retention of the general health. When any doubt exists, it may usually be promptly dispelled by a resort to the exploring needle.

When the tumor is large and old, it sometimes manifests a disposition to ulcerate, but, in general, as it goes on increasing, the skin gradually accommodates itself to its size. In cases of long standing, it may take on carcinomatous action, although such an occurrence is very uncommon.

The *treatment* varies. The unilocular form of the disease sometimes disappears under the steady use of discutient remedies, as a strong solution of hydrochlorate of ammonia, or a mixture of equal parts of alcohol and spirits of camphor, with a small quantity of Goulard's extract. Sometimes, again, a cure may be effected with the seton, the injection of iodine, or the insertion of a tent. When the cyst is old, unusually large, or partially filled with solid matter, nothing short of excision will answer, and there is the more reason for its performance when there is a probability that the tumor has completely annihilated the glandular structure of the organ. The only remedy, when the growth is multiple or multilocular, is thorough ablation.

2. HYDATIC TUMORS.

Hydatids seldom infest this gland, at least in the females of this country. In the examination of a great number of breasts, I have not met with more than two cases. They always belong to the class of echinococci, and are most common between the ages of twenty-five and fifty. Varying in volume between a currant and an orange, they may occur in any portion of the organ, the proper substance of which they generally completely destroy. They are of a globular figure, and present themselves either in clusters, or as bodies perfectly distinct from each other. When of considerable size, it is not uncommon to find within the old hydatids young ones, hanging by narrow footstalks, and having precisely a similar configuration and structure. The contained fluid is generally thin and limpid, but it may be thick and glairy, like the white of egg. In the older hydatids, especially such as are partially dead, there is sometimes an admixture of blood, pus, albumen, or curdy matter. These bodies may exist either alone, or in connection with other morbid products; and, when bulky and numerous, are productive of extraordinary enlargement of the breast, cases now and then occurring where the organ weighs from eight to ten pounds.

As in the cystic tumor, so in this, the *diagnosis* is often very difficult, if not impossible. In its earlier stages, the disease is liable to be confounded with scirrhus; afterwards, when it has attained a large bulk, with encephaloid. The most important signs are, the tardy progress of the case, the unimpaired state of the general health, the absence of lymphatic involvement, the natural appearance of the skin, and the globular or ovoidal shape of the tumor, together with its large size and want of adhesion to the surrounding structures. The pain is usually much greater than in mere cystic disease, although there is sometimes none at all, and there is but little fluctuation, except when the tumor has acquired a large bulk, when it is always well marked. There is nothing, however, of a truly diagnostic character in any case, except the escape of some of the contents of the tumor.

The only remedy for the hydatic tumor is thorough excision, performed as soon as possible after the establishment of the diagnosis. The operation is never followed by relapse.

3. LACTEAL TUMORS.

The breast, in consequence of the occlusion of some of its lactiferous ducts, is liable to an inordinate accumulation of milk, forming a distinct swelling, known as the milk tumor. It is generally of a globular or ovoidal shape, and is capable of acquiring a large bulk, as is evident from some of the reported cases. Thus, in one related by Dr. Willard Parker, in a woman aged thirty-five, three quarts of fluid were evacuated at the first operation, and half that quantity in a week afterwards. In an instance recorded by Scarpa, the breast measured thirty-four inches in circumference, and gave vent, on being punctured, to upwards of a gallon of pure milk. It has been supposed that the sac in which the fluid is contained, is formed by the dilatation of the lactiferous tubes; but, considering the rapid development of the tumor, and the enormous volume which it occasionally attains, the more plausible conjecture is that the milk is poured out into the connecting cellular tissue of the gland, which is thus gradually condensed into a kind of cyst. The swelling usually begins within the first month after delivery, and often attains a large bulk in a few weeks. It is attended with a peculiar sense of distension, without any decided pain, and distinctly fluctuates under the finger. On cutting into it, the contents are found to be of a whitish color, and of the consistence of milk, cream, or whey. The general health is unimpaired. When the tumor is unusually voluminous, there is always marked enlargement of the subcutaneous veins.

There is a form of milk tumor of the breast, in which the contents are of a solid character, bearing a close resemblance to butter, and hence called the *butyroid* tumor. It consists of a cyst, inclosing a yellowish, concrete substance, of the appearance of butter, cheese, or casein. Microscopical and chemical examinations render it highly probable that this formation takes its rise in a deposition of milk, consequent upon the rupture of a lactiferous duct, the more fluid portions being absorbed, while the solid are retained, and thus gradually assume the properties here assigned to them. The disease is very uncommon, and the diagnosis must necessarily be obscure.

The *treatment* of the milk tumor should be conducted upon the same principle as that of any other encysted formation; that is, either by the injection of some stimulating fluid, as the dilute tincture of iodine, by the seton, or by the tent, care being taken that the resulting inflammation does not run too high. When the tumor is solid, the proper operation, of course, is excision.

4. ADENOID TUMORS.

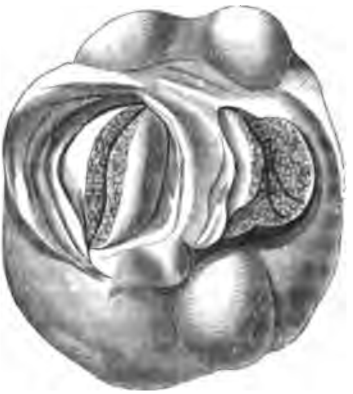
The breast is liable to a species of fibrous transformation, not unlike that occasionally seen in the testicle. It is principally observed in young females, either single, or married and without offspring. The tumor, which is slow in its formation, is free from malignancy, and is seldom attended with any marked disorder of the general health. The breast feels hard, usually somewhat unequally so, and often acquires a considerable bulk, producing perhaps, ultimately, considerable inconvenience by its weight. The subcutaneous veins become gradually enlarged, but there is hardly any pain, and no involvement of the neighboring lymphatic ganglions. The nipple is generally natural. The disease usually arises without any assignable cause.

The intimate structure of this tumor consists of a pale grayish, pink, or bluish substance, nearly homogeneous, friable, easily crushed, and very similar to that of a hypertrophied lymphatic ganglion. Hence, the term adenoid, now generally applied to it. Some parts of it may be so hard as to creak under the knife, and specimens occur which possess all the properties of old fibrinous concretions. Minute cells, variable in size and number, are occasionally scattered through it. Generally the tumor is inclosed by a distinct capsule of condensed cellular tissue. The probability is that the transformation commences in the interlobular substance of the organ, and that new fibrous tissue is superadded, which, by its pressure, causes at first atrophy, and finally total destruction of the primitive glandular texture.

The adenoid mamma is occasionally filled with small nodules, of a rounded form, from the size of a filbert to that of a common hickory-nut, hard, almost inelastic, movable, inclosed in cysts, and perfectly distinct from each other, the intervals between them being occupied by fibrous substance. In a specimen in my cabinet, removed from a married, but sterile, female, aged thirty-three, each breast contains at least a dozen of such masses. The disease had been in progress for upwards of three years, and was attended with considerable enlargement of each gland, but there was an entire freedom from pain, lymphatic involvement, and disorder of the general health. The organs were perfectly movable, and numerous nodules could be felt in their substance in every direction. The nipples were badly developed, but not more retracted than we often see them in women who have never borne children.

Upon making a careful examination of the little bodies above described, I found that they all consisted of a kind of cyst, inclosing a mass bearing a striking resemblance to a cauliflower, being composed of a fibrous membrane, of a white, glistening appearance, thin, and semi-transparent, folded like the ruffle of a shirt, and studded with an immense number of small, delicate excrescences, looking very much like the warts which are so often met with upon the penis. They all adhered by a broad base or stem, and were made up each of a number of minute granules, resembling the eggs of certain insects. Under the microscope, Dr. Da Costa and myself found the stems to consist of fibrous tissue, while the granules were made up, for the most part, of rounded bodies, presenting a delicate, fibrillated stroma, inclosing small, ovoidal, and spindle-shaped cells in varying proportion. The hard part of the mamma, that in which the nodules were developed, was composed of bundles of very dense fibrous tissue, wavy, and extremely distinct. Fat-cells were here and there discernible in its meshes. The adjoining cut, fig. 678, represents, though very imperfectly, the internal structure of these nodules.

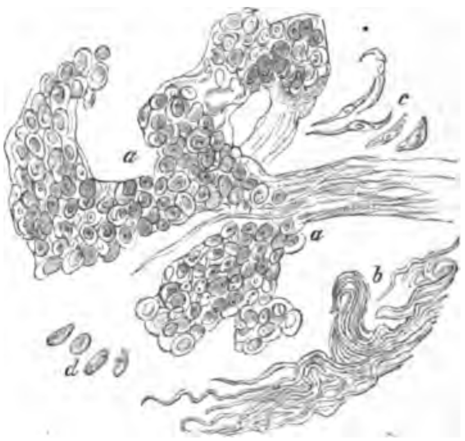
Fig. 678.



Adenoid tumor of the mamma, exhibiting its cystiform arrangement and internal structure.

The microscopic features of the ordinary fibrous tumor of the mammary gland are well exhibited in fig. 679, from a drawing by Dr. Packard, from one of my clinical cases, a woman, aged, forty-three. A section of the growth, treated with acetic acid, revealed 1st, portions of lactiferous tubes, some lined with epithelium, and others showing merely a basement-membrane; 2d, fibrous tissue; and, 3d, fibro-plastic cells in small numbers. The tumor, about the volume of a large fist, had commenced seven years previously, and had latterly been the seat of sharp, shooting pains. There was no retraction of the nipple, lymphatic involvement, enlargement of the subcutaneous veins, or serious disorder of the general health.

Fig. 679.



Fibrous mammary tumor. *a.* Gland tube, containing nucleated cells. *b.* Fibrous tissue. *c.* Fibro-plastic cells. *d.* Free nuclei. 472 diameters.

The only reliable remedy in the *treatment* of this tumor is excision, but such a measure will only be required in the event of the morbid growth being very large, painful, or inconvenient by its weight. Sorbefacient applications, and the exhibition of iodine, are usually of no benefit. Compression might be tried in the earlier stages of the disease.

5. LYMPHATIC TUMORS.

The lymphatic vessels of the breast, under the influence of chronic inflammation, are liable to become enlarged and indurated, forming small, cord-like masses, tender on pressure, and the seat of acute pain. The disease may be produced by external violence, as a blow or fall, but in general it makes its appearance without any assignable cause. It is most common in young suckling and chlorotic females, between the ages of twenty and thirty, and is usually associated with disorder of the digestive apparatus and defective menstruation. Sometimes it coexists with chronic engorgement of the uterus. The duration of the affection is variable; in some cases it runs a kind of acute course; in others, and they constitute the great majority, it is chronic, lasting, with an occasional intermission of suffering, for months and even years.

The swelling may be superficial or deep seated, and is often so small as to escape observation; in general, however, it may readily be detected by pressing the parts between the thumb and index finger. In volume it ranges between a hazelnut and an almond; in rare cases it may reach the size of of a pullet's egg. It is of an irregular, cord-like shape, very firm, slightly elastic, and very tender on pressure. The breast commonly retains its normal characters, but the organ, especially in cases of long standing, feels heavy and uneasy. The lymphatic ganglions in the axilla occasionally sympathize with the mammary affection, becoming sore and swollen. Ulceration of the tumor may occur, but such an event is uncommon.

The diseases with which the lymphatic tumor is most liable to be confounded, are neuralgia and chronic enlargement of the breast. From the former it may generally be easily distinguished by the peculiar cord-like shape of the tumor, and by the circumscribed character of the concomitant pain and tenderness; from the latter, by the absence of lobes and cysts, and the smaller size of the breast. In neuralgia, the pain is generally diffused, paroxysmal, and coexistent with similar pain in other parts of the body; while in the chronic mammary tumor the breast progressively increases in bulk, which is sometimes enormous. The lymphatic tumor is peculiar to young suckling, chlorotic women, and is, as above seen, always accompanied with derangement of the uterine and digestive functions.

The morbid structure, on dissection, is found to consist of a thickened and enlarged condition of the lymphatic vessels imbedded in indurated areolar tissue, the whole forming a dense fibroid mass, slightly elastic under pressure.

In the *treatment* of this affection, special care should be taken to correct and improve the general health. In most cases, the patient will be greatly benefited by a regular course of chalybeate tonics, an occasional mercurial purgative, change of air, and a properly regulated diet. The most suitable local remedies are leeches, tincture of iodine, saturnine lotions, sorbefacient and anodyne plasters, and constant support of the breast. In obstinate cases, the affected structures may be excised, but so harsh a measure will seldom be necessary.

6. FATTY TUMORS.

The fatty tumor of the breast is uncommon. I do not recollect ever to have seen an instance of it. The growth is generally situated behind the gland, between it and the pectoral muscle, but cases occur in which it lies in front, and now and then the organ seems to be completely imprisoned in it, the morbid mass being internally connected with its interlobular cellular substance. The tumor is sometimes of enormous bulk. Thus, in a case observed by Sir Astley Cooper, it was thirty-one inches in circumference by ten and a half in length, and weighed upwards of fourteen pounds after removal.

The difficulty of distinguishing such a tumor is strikingly exemplified in a case related by Brodie. A lady, he remarks, had a growth in her breast, concerning which she obtained the opinions of some of the leading surgeons of that day. "One thought that it was fungus hematodes, another believed that it was something else, and another could not say what it was. At last it was decided to cut down on the tumor, and then it was found to be a great mass of fat." It was situated behind the breast, which it had pushed out in such a manner as to give it an unnaturally prominent appearance.

The only remedy is extirpation, and, in performing the operation, care must be taken not to inflict any serious injury upon the breast.

MALIGNANT TUMORS.

The most common malignant diseases of the mamma are scirrhus and encephaloid. Melanosis and colloid are extremely infrequent.

1. SCIRRHUS.

Scirrhus of the breast is most common soon after the decline of the menses, in married females, the greatest number of cases occurring between the ages of forty-five and fifty-five. It is extremely rare to meet with an instance before the fortieth year. I have repeatedly seen the disease after the age of seventy. Sir Astley Cooper met with an instance at eighty-six. On the other hand, it may occur at a very early period. The youngest case I have ever had was a woman of twenty-seven. Carmichael saw scirrhus in both breasts in a girl twelve years old; and Everard Home relates an instance in which it began at the fifteenth year.

Old maids occasionally suffer from it, but much less frequently, relatively speaking, than women who have borne children. Its origin is generally spontaneous, although it is often referred by the patient to the effects of a blow or some other external violence. It has been known to happen in four or five members of the same family, and occasionally it coexists with scirrhus in other parts of the body. An instance now and then occurs in the male.

The disease is usually confined to one breast, and the left suffers more frequently than the right. When both glands are affected, the attacks are always consecutive, never simultaneous. The scirrhous matter is deposited in two varieties of form, the nodular and the infiltrated.

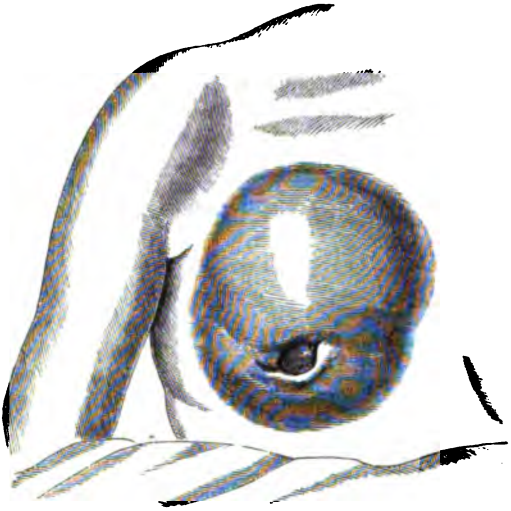
The nodular or tuberous variety usually begins insidiously, in the axillary border of the gland, as a small circumscribed lump, hard and irregular to the touch, and somewhat tender on pressure. As the disease progresses, the whole organ becomes involved, assuming a firm and knobby character, movable, and the seat of occasional pain, of a sharp, lancinating, darting nature. Advancing still farther, the tumor gradually contracts adhesions to the surrounding parts, especially to the pectoral muscle, so that eventually it can no longer be lifted up, or pushed about. In the meantime the nipple is retracted; the skin is puckered and discolored; the superficial veins enlarge, and assume a deep bluish tinge; and presently ulceration sets in, leaving one or more circular sores, with hard, depressed, angry-looking edges, and a foul, sloughy base. The discharge is thin, ichorous, offensive, and often so acrid as to erode the healthy skin. Gradually the irritation extends to the neighboring lymphatic ganglions, which either become white, firm, and tumid, or they are rendered preternaturally soft and vascular, having often a bloodshot appearance.

The retracted appearance of the *nipple* is well shown in fig. 680, from a patient at the clinic of the Jefferson Medical College. It often begins early in the disease, and is produced by the manner in which the lactiferous tubes are compressed by the scirrhous matter, an effect admirably exhibited in fig. 681.

Although scirrhus generally commences in the glandular structure of the mamma, yet occasionally its primitive seat is in the common integuments or in the surrounding cellulo-adipose tissue. In the former case it usually presents itself as a small, rounded tubercle, scarcely larger than a shot, of a bluish color, firm, superficial, movable, and free from pain. This, gradually increasing, finally involves the glandular structure, the skin, meantime, becoming hard, discolored, and intimately adherent to the subjacent parts. In the other variety of the disease, a firm, oblong, or spherical lump, of considerable volume, is from the first felt deeply imbedded in the adipose tissue around the organ, with the latter of which it has apparently as yet no connection. It may readily be lifted away with the thumb and finger, but it soon contracts adhesions, gradually contaminates the adjacent structures, slowly approaches the surface, and at last breaks out into a foul, irritable, fungous ulcer.

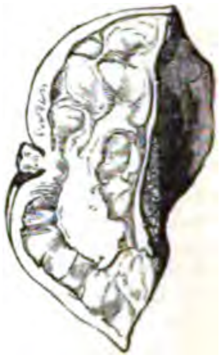
The infiltrated variety of scirrhus may begin, first, in the interlobular cellular tissue of the gland, forming hard, ill-defined radiating masses gradually lost in the surrounding structures; or, secondly, in the proper substance of the organ, as a knotty mass, very firm, circumscribed, movable, wrinkled on the surface, and composed of numerous little granules; or, lastly, in and around the lactiferous tubes, near the nipple, which is soon remarkably retracted in consequence.

Fig. 680.



Scirrhus of the mamma, showing the characteristic retraction of the nipple.

Fig. 681.



Scirrhous tumor of the breast, exhibiting a section of the retracted nipple.

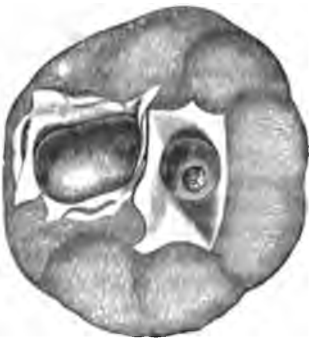
On *dissection*, the mamma is found to be inelastic, firm, dense, and crisp, like cartilage, which it also resembles in color; sometimes it is of a dry, fibrous texture, like the interior of an unripe pear, and of a light grayish tint, interspersed with yellowish lines, probably the remains of lactiferous ducts; more rarely the organ is soft and succulent, presenting a considerable number of small vessels, and yielding, upon pressure, a thin, opaque, serous fluid, occasionally blended with milk. These appearances frequently occur together, forming so many zones, gradually and insensibly running into each other. In some instances, again, the tumor contains one or more cavities, filled with purulent matter, or with a viscid, ropy fluid, not unlike the synovia of the joints.

The volume of a scirrhous breast is extremely variable. When the patient is very fat, the tumor is generally proportionately large, owing to the presence of an extraordinary quantity of adipose matter. The morbid mass itself, carefully divested of extraneous substance, seldom exceeds the size of a large orange. There is, however, a form of the disease, known as the *atrophic scirrhus* of the breast, in which the tumor is generally not larger than a small walnut, including both normal and abnormal tissues, which appear to be shrivelled up into one solid mass, of remarkable hardness and density. It is most common in advanced life, and often remains stationary, or nearly so, for years together, though eventually it is not less fatal than ordinary mammary cancer.

The malady, as already stated, usually commences in a few lobules; but as it progresses, the whole organ is converted into a firm, solid mass, with a rough, tuberculated surface. In the annexed sketch, fig. 682, taken from a specimen in my cabinet, a large number of nodules are seen, the largest of which, hard and crisp, like cartilage, and of an oblong, spherical shape, scarcely equal the size of a pullet's egg. Fig. 683 exhibits a section of one of these bodies.

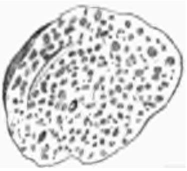
Scirrhus of the breast sometimes remains quiescent for a considerable length of time, when, taking, as it were, a fresh start, it rapidly assumes the characters above assigned to it. When removed, it is almost certain eventually to return, either at the cicatrice, or in the contiguous lymphatic ganglions. The tumor is occasionally invaded by gangrene, even before ulceration has commenced. In a case of this kind, which came under my observation a few years ago, and which is described in the chapter on the general history of scirrhus, the morbid growth was lifted completely out of its bed, the cavity being afterwards filled up with healthy granulations, though the disease returned subsequently in the neighborhood of the original affection.

Fig. 682.



Scirrhous mamma laid open to show its lobulated structure.

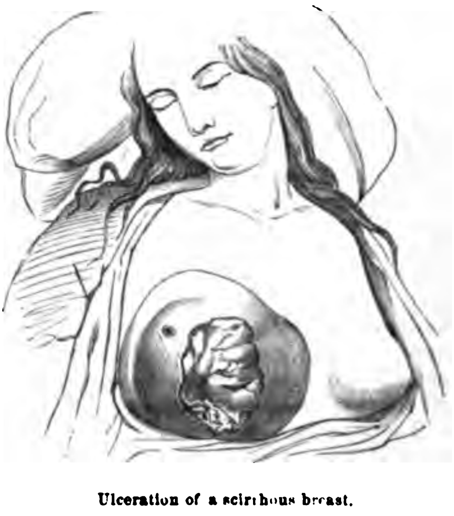
Fig. 683.



Section of a scirrhous nodule.

The *symptoms* of scirrhus of the breast are usually characteristic. Its lump-like origin in the body of the organ, the slow but steady progress, the great hardness and comparatively small volume of the tumor, the sharp, lancinating pain, the retraction of the nipple, the gradual adhesion of the gland to the surrounding structures, and the ultimate involvement of the neighboring lymphatic ganglions, as those of the axilla and subclavicular region, are phenomena which it is impossible to misinterpret. The nature of the scirrhous ulcer is also peculiar. It has an excavated appearance, as if a portion of the tumor had been punched out, with a foul bottom, and steep, everted edges. The discharge is thin, sanious, fetid, irritating, and more or less abundant. Hemorrhage sometimes occurs, but seldom to any extent. Retraction of the nipple generally exists in a marked degree, and often begins at an early period of the complaint. Enlargement of the lymphatic ganglions, which seldom shows itself before the end of the ninth or tenth month, is commonly very conspicuous after ulceration, especially in the axilla. In the more severe forms of the disease, it generally affects those also of the subclavicular region and even those of the neck. Swelling, pain, and numbness of the corresponding extremity always attend the malady in its latter stages, and greatly augment the suffering, the limb becoming perfectly stiff and useless, and feeling like a mass of lead.

Fig. 684.



Ulceration of a scirrhous breast.

The annexed drawing, fig. 684, taken from a clinical case, exhibits the condition of a scirrhous breast in the advanced stage of the disease, after the occurrence of ulceration. The tumor was of unusual volume.

The *general health* is variously affected. In most cases it remains comparatively good until ulceration begins, when it usually rapidly declines, the body becoming emaciated, and the countenance exhibiting that peculiar sallow, cadaverous appearance, so denotive of the cancerous cachexia.

The infiltrated variety of scirrhus may begin, first, in the interlobular cellular tissue of the gland, forming hard, ill-defined radiating masses gradually lost in the surrounding structures; or, secondly, in the proper substance of the organ, as a knotty mass, very firm, circumscribed, movable, wrinkled on the surface, and composed of numerous little granules; or, lastly, in and around the lactiferous tubes, near the nipple, which is soon remarkably retracted in consequence.

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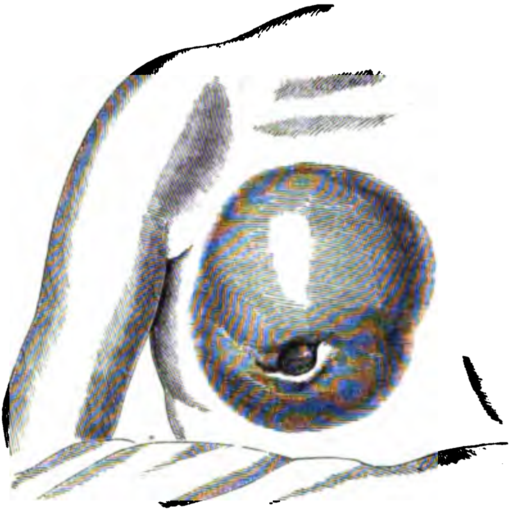

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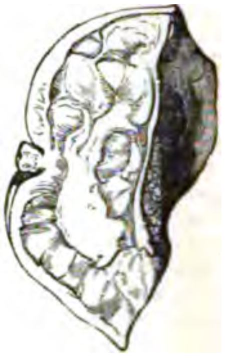

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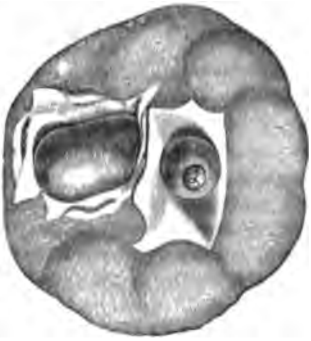

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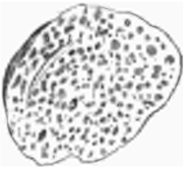

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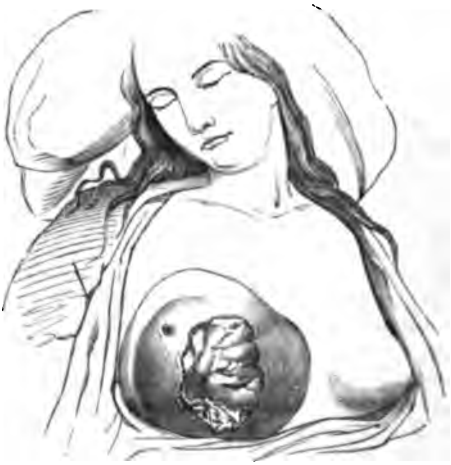

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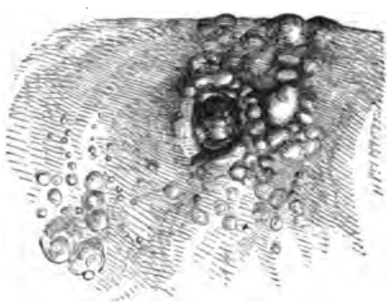
The *general health* is variously affected. In most cases it remains comparatively good until ulceration begins, when it usually rapidly declines, the body becoming emaciated, and the countenance exhibiting that peculiar sallow, cadaverous appearance, so denotive of the cancerous cachexia.

The pain, in the latter stages of the disease, is generally atrocious, depriving the patient both of appetite and sleep.

The *duration* of the disease is far from being uniform. Left to itself, it generally terminates fatally at a period varying from eighteen months to two years and a half. Occasionally death happens much sooner; and, on the other hand, instances occur in which it does not destroy life under ten, fifteen, twenty, or even twenty-five years, although such an event is extremely uncommon. When ulceration has once fairly begun, the health is rapidly undermined, and the patient usually perishes in a few months. The immediate cause of this event is either sheer exhaustion from excessive pain, loss of sleep and want of appetite, or pneumonia, hydrothorax, or pulmonary œdema. The most rapidly fatal cases generally occur in young females. Roux met with an instance in which death took place in three months from the commencement of the attack. In old women the disease often remains quiescent for many years, especially when the tumor is uncommonly small.

Fig. 685.



Secondary scirrhous nodules.

During the progress of the disease, *secondary scirrhous growths* sometimes appear; generally in the skin and cellular tissue of the breast, or in the parts immediately around, in the form of tubercles varying from the volume of a small shot to that of a pea, exceedingly firm and solid, slightly movable, very tender on pressure, and the seat of sharp, pungent pain. They often exist in large numbers, as in fig. 685. In one case I counted upwards of fifty. Occasionally they occur both over the mammary gland and at some distance from it. In an instance recently under my care, in a female upwards of fifty, whose breast had been the seat of an enormous scirrhous tumor, of nearly two years' standing, tubercles of this kind appeared a few weeks before death upon the corresponding side of the trunk near the spine, shoulder, neck, and head, and also upon the upper part of the opposite arm. As these secondary growths increase in size, they project beyond the skin, and exhibit a red, vascular, angry appearance, denotive of the worst consequences, and, of course, imperatively forbidding surgical interference.

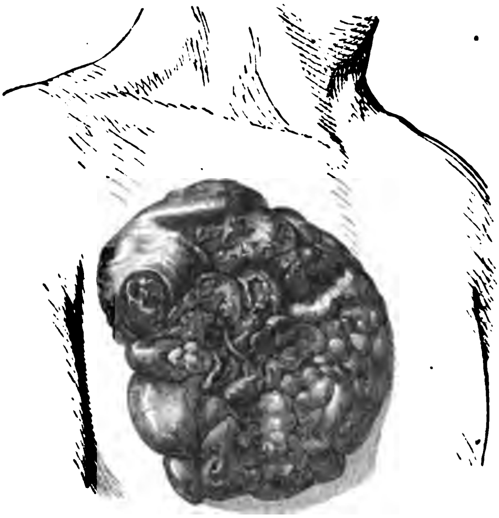
2. ENCEPHALOID.

In comparison with scirrhus, encephaloid of the mamma is a rare disease. Of 54 cases analyzed by Velpeau, 36 occurred between the fortieth and sixtieth years, and most of the cases that have fallen under my personal observation happened in elderly subjects. I have, however, repeatedly met with it before the age of thirty-five, and in one instance in a girl of fifteen. Of its relative frequency to encephaloid in other organs, it may be stated that of 100 cases of the disease analyzed for me by Dr. Cassot, only 6 occurred in the breast, the eye being affected in 10, and the scrotum and testicle in 14.

It is not possible to tell with any degree of exactitude the proportion which the cases of encephaloid bear to those of scirrhus. Professor J. B. S. Jackson asserts that it is not less than one-fifth; but this does certainly not accord with the results of my observations. I have seen a large number of cases of carcinomatous breasts, and I am quite sure that at least nineteen-twentieths of them were examples of scirrhus. Soft cancer of the mamma appears to be much more common in France and Germany than in England, where, according to Paget, it occurs in the ratio only of about five to ninety-five.

The *symptoms* are commonly well-marked. Ordinarily the disease begins, without any assignable cause, as a small tumor in the substance of the gland, which generally increases with frightful rapidity, often acquiring the bulk of a large fist or even of a fœtal head in the course of a few months. Like scirrhus, it is at first movable, but eventually it is firmly united to the surrounding structures, which it is sure, in time, to involve and contaminate. The pectoral muscle, in particular, is liable to suffer in this manner. The lymphatic ganglions, however, generally escape longer, comparatively speaking, than in hard cancer, and I have seen cases in which, although there was extensive ulceration, they were entirely free from disease. Moreover, the subclavicular and cervical ganglions are less liable to suffer than in scirrhus. The tumor is usually knobby or tuberculated, and of varying degrees of consistence, being firm and incompressible at one point, soft at another, and perhaps fluctuating at a third. There is seldom any marked retraction of the nipple, even in the advanced stages of the malady. The subcutaneous veins are always greatly enlarged; the pain is comparatively slight; and the parts are generally singularly tolerant of manipulation. Ulceration sets in at variable periods; rarely before the ninth month or later than the twelfth. The resulting sore is peculiar. Its character is essentially that of a fungus, projecting beyond the surrounding level, soft, red, and the seat of more or less bleeding, and of a constant sanious, or thin, fetid, and sanguinolent discharge. The edges of the ulcer are sharp and undermined, and often drawn tightly over the protruding mass. Like the scirrhous ulcer, the encephaloid is intractable; its tendency is to spread, not to heal, neither having the power of forming healthy granulations. The external characters of the fungating and bleeding stage of the disease are well shown in fig. 686.

Fig. 686.



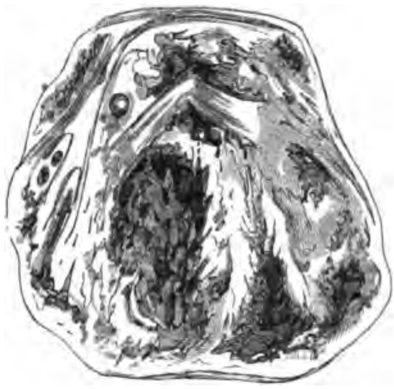
Encephaloid of the mamma, in its open bleeding state.

The general health usually suffers at an early period; the patient loses flesh and strength, and the countenance exhibits a sallow, withered appearance, denotive of the profound impression which the disease is making upon the system. The pulse is small, frequent, and irritable, the appetite fails, sleep is interrupted by the pain and the discharges, night-sweats set in, and thus the case steadily progresses, from bad to worse, until life is worn out by exhaustion. Sometimes the immediate cause of death is hemorrhage. In some cases the patient perishes from hydrothorax, pneumonia, pleurisy, or pulmonary œdema. The period at which life is worn out varies, on an average, from six to twelve months.

The *diagnosis* of encephaloid is, in general, too well marked to admit of error, especially if the disease has taken a fair start. The great size, rapid growth, and comparative softness of the tumor, the healthy condition of the nipple, the enormous enlargement of the subcutaneous veins, the absence for a long time of severe pain, and the early constitutional involvement, will always serve to distinguish it from every other disease of the mammary gland. When, however, any doubt exists as to the diagnosis, as there may when the tumor has been developed with extraordinary rapidity, or when it presents well-marked evidence of fluctuation, the exploring needle may be used; of course, with great caution. After ulceration has begun, error is impossible.

The *anatomical characters* of encephaloid of the breast do not differ from those of soft cancer in other organs of the body. The structure of the tumor is seldom uniform, either as it respects its consistence, color, or composition. Thus, on making a section of it, one portion may perhaps be of a fibro-cartilaginous character, another pulpy and brain-like, and a third probably hematoid, or cystiform. Cavities or cells, containing different kinds of fluids, are often interspersed through it. Large clots of blood, of a black, brownish, or yellowish-buff color, and of varying degrees of consistence, are also sometimes met with. The tumor has no capsule, except what is derived from the surrounding cellular tissue, which is occasionally considerably condensed; its surface is rough and lobulated, and its substance is usually pervaded by numerous vessels, many of them of large size. Hence the rapidity of its growth, its large bulk, and the frequent and exhausting hemorrhages after ulceration has commenced. It sometimes coexists with encephaloid or scirrhus in other organs. Fig. 687 affords a good idea of the hematoid form of encephaloid of the mamma. The tumor from which the drawing was taken was of very large size, and was removed by me from a negress, thirty years old.

Fig. 687.



Encephaloid of the mammary gland, of the hematoid variety.

3. COLLOID AND MELANOSIS.

Colloid, alveolar, or gelatiniform cancer rarely attacks the breast. The tumor advances slowly, and seldom exceeds the volume of a fist or of a fœtal head. Externally, it is of a light grayish color, dense, firm, glistening, and irregularly lobulated; internally, it is comparatively soft and succulent, yielding some moisture on pressure, and tearing into hard, jelly-like strings. The cellular arrangement, so well marked in alveolar cancer of the stomach, is seldom very distinct in that of the breast.

Melanosis of the breast occurs either as an infiltration amongst the granules of the gland, or, as is more frequently the case, in the form of small, spherical nodules, of a black, sooty color. The only instance of this disease that I have ever seen occurred in an old female who died of pulmonary phthisis, accompanied with scirrhus of the left mamma. The little tumors, five in number, were distinctly encysted, and contained a thin, ropy fluid, of the color and consistence of China ink.

Mr. Paget has described a case of what he calls the *myeloid* tumor of the breast in a woman fifty years old. It had existed for nine months, and was of an irregular, rounded form, from two to three inches in diameter, hard, heavy, and the seat of occasional pain. When extirpated it was found to be a distinct growth, completely separated from the mammary gland, and in a partial state of suppuration. Some of the axillary ganglions were enlarged, but not indurated. Six months after the operation, however, these bodies developed themselves in a firm, solid mass, which, ulcerating, and often bleeding profusly, finally destroyed the patient.

Such a tumor hardly deserves to be called myeloid. Its history clearly proves it to have been scirrhous. The secondary formation was doubtless of an encephaloid character.

TREATMENT.

The treatment of cancer of the breast naturally divides itself into medical and surgical, or, in other words, into palliative and radical. The medical, again, resolves itself into constitutional and local.

The great object of the constitutional treatment is simply to maintain the general health as nearly as possible at the natural standard. The more successfully this can be done the more likely will the case be to progress favorably. The best means for fulfilling this indication are, a proper regulation of the diet, bowels, and secretions, the avoidance of pain, and an abundance of sleep, with an equable, contented state of mind.

The most appropriate diet, in my judgment, for a cancerous patient, is that which best agrees with the stomach and affords the most abundant supply of wholesome nourishment in the smallest compass. Everything that tends to provoke flatulence and indigestion should be carefully avoided. If the woman is plethoric, the food should be principally of a farinaceous character, with weak tea or milk at breakfast and supper; if, on the contrary, she is thin, pale, and feeble, more or less meat will be required, and the most suitable articles are boiled fish, oysters, lamb, and poultry. In addition to a nutritious diet, the case may be such as imperatively to demand the moderate use of ale, wine, brandy, or milk punch.

The bowels should be constantly maintained in a soluble condition; but everything like active purgation must be avoided. Any tendency to disorder of the secretions must be counteracted with blue mass, or a small quantity of calomel, given at bedtime and carried off in the morning with a little magnesia or Rochelle salts. As an habitual laxative nothing answers better than Plummer's pills. Flatulence and acidity must be corrected with alkalies; derangement of the menstrual function with emmenagogues.

Pain is allayed by anodynes, as morphia, opium, black drop, or deodorized laudanum, in doses suited to the exigencies of the case. When the skin is hot and dry the best article is Dover's powder, either alone or combined with opium and a few grains of blue mass, to prevent the medicine from drying up the secretions.

Sleep must be secured at all hazard; and nothing will contribute more to the comfort and well-being of the patient than a tranquil and resigned state of the mind. Change of air and scene is often highly beneficial; and sometimes marked relief follows a residence at the sea-coast.

As it respects internal remedies, all ideas of specifics must be banished, and the case managed upon general principles, precisely as in any other disease. The accumulated experience of two thousand five hundred years has proved that all attempts to cure cancer of the mammary gland and of other organs, by means of medicines, however well directed or perseveringly continued, are perfectly futile. They often, however, do good by improving the general health, and on that account deserve careful consideration. The most valuable articles are the different preparations of quinine, bark, and iron, either alone or variously combined. Arsenic is also a useful agent, and perhaps the best form in which it can be given is the iodide, in the dose of one-sixteenth of a grain thrice a day. Fowler's solution is objectionable, on account of its tendency to produce anasarca and dropsical effusions. Cicuta, sarsaparilla, iodine, mercury, alkalies, acids, cod-liver oil, and iodide of potassium, so frequently employed in this disease, possess no particular virtues either in modifying its action or in arresting its progress. As to venesection, it may be of benefit when extraordinary plethora is associated with excessive pain and great local excitement; but, in general, it could hardly fail to be injurious.

The topical treatment is of great importance. The affected organ should be carefully suspended, and all sources of pressure removed. If inordinate vascular excitement exists, from six to a dozen leeches should be applied, especially if the patient is plethoric, and the flow of blood encouraged for some hours with cloths wrung out of warm water. Afterwards the parts may by kept constantly wet with a strong solution of acetate of lead and opium, or Goulard's extract and laudanum. Sometimes a light emollient poultice, medicated with these articles, exercises a very soothing influence, and, in many cases, marked relief follows the use of the dilute tincture of iodine, containing from eight to ten grains of morphia to the ounce. Anodyne plasters are generally extremely beneficial; but, to answer the purpose, they should be well spread, carefully applied, and free from irritating matter. The best are those made of opium, arnica, cicuta, stramonium, and belladonna. The soap, compound galbanum, and DeVigo's plaster are also useful applications, especially if well sprinkled with morphia.

Systematic compression, formerly so much vaunted, is utterly useless, except now and then in the early stage of scirrhus, when it may assist in relieving pain and retarding growth. It may be applied with Tanchou's spring pad, an instrument constructed upon the principle of a truss, an Arnott's air-cushion, or, what is better than either, prepared sponge and a roller. As a curative agent it is perfectly worthless, as I can testify from repeated and faithful trials.

When ulceration arises, the leading indications are to moderate discharge, prevent hemorrhage, mitigate pain, allay fetor, promote cleanliness, and sustain the strength. These objects may, in general, be readily fulfilled by means of soothing applications, persulphate of iron, anodynes, Labarraque's solution or permanganate of potassa, frequent ablutions, and a nourishing diet with milk punch. When copious hemorrhage ensues, and it cannot be checked by the usual hemostatics, it may be necessary to resort to acupressure, especially if the blood issues from an artery or vein of considerable size.

By means of these measures, judiciously employed, the patient may often live in great comfort for months and even years. Gradually, however, the vital powers give way, the countenance assumes the peculiar sallow expression, so indicative of the cancerous cachexia, and she finally expires in a state of complete exhaustion.

In regard to the use of the knife, as a means of relief in cancer of the breast, the greatest possible contrariety of opinion exists. While some are altogether opposed to it under any circumstances, there are others who do not hesitate to resort to it in every case, and at almost every stage of the disease, either as a curative or as a palliative measure. They argue that it is better to operate even if it affords only temporary relief, than to abandon the patient to her fate; and, on the other hand, they positively assert that extirpation is occasionally followed by a complete cure, or, if not a complete cure, by such a protracted immunity from disease as virtually to amount to that.

It has been a question with surgeons whether extirpation of a cancerous breast does, on an average, tend to shorten or prolong life. The subject has been examined by different observers, but the only reliable statistics, so far as I know, are those that have been supplied by Sibley and Paget. The former of these writers finds that the average duration of life in primary scirrhus of the breast, allowed to pursue its natural course, was 32 months, whereas in those subjected to the knife it amounted to 53 months, thus showing a difference of 21 months in favor of the latter. In Paget's cases the unoperated afforded an average of 48 months, and the operated of 57½. The effect of the removal of medullary cancer is less propitious. The disease always proves more rapidly fatal than scirrhus, whether it be let alone, or whether it be subjected to the knife.

In all calculations of this kind there must necessarily be many sources of fallacy, more or less influencing the result. Among these, not the least is the difficulty of tracing such cases to their final termination. My experience is that the average duration of life, in unoperated cases of scirrhous breast, does not afford nearly as high an average as that given by Paget. It approaches much nearer to that of Sibley. The statistics of both are on too limited a scale to entitle them to much practical weight.

The age at which the malady appears exerts a marked influence upon the duration of life. Thus, Paget, in his tables, finds that, of those who lived only eighteen months, the cancer commenced at 43 years; of those who were spared from eighteen to thirty-six months, at 51 years; and of those who survived from three to eight years, at 56 years.

That excision of a cancerous breast, both in the soft and hard varieties of the disease, may greatly prolong life, if not actually lead to a radical cure, is unquestionable. That the instances, however, are rare, and therefore exceptional, is equally true. Velpeau, in 1834, extirpated an encephaloid breast, of the size of a child's head, and, in 1853, when he last saw the patient, the parts were perfectly sound. The tumor, at the time of the operation, was in an ulcerated, fungous condition, and the seat of an ichorous, bloody discharge, latterly attended with occasional hemorrhage. The diagnosis was unmistakable. In a case communicated to me by Dr. J. Mason Warren there was no relapse at the end of six years. The woman was sixty-nine years of age, and the tumor, a specimen of pure encephaloid, weighed nearly three pounds. I am cognizant of an instance of a similar kind, in which there was no return at the end of seven years, the woman in the mean while having given birth to two children. The diagnosis was attested by a microscopical examination of the morbid structure.

The records of surgery supply us with quite a number of examples of scirrhus of the mamma in which no relapse occurred for a number of years. Dr. J. C. Warren met with four cases in which the patients survived the operation, and finally died of some other malady, respectively, 19, 21, 22, and 33 years. Brodie refers to two instances of 14 and 16 years. Velpeau saw one of 12, and another of 27 years. Physick gives a case of 9 years; Mussey of 10; Paget of 11½. The longest case that has occurred in my own practice is one of 3 years; the woman, however, is still alive, and in excellent health.

These, again, are all exceptional cases; and opposed to them is the melancholy fact, familiar to every surgeon of experience, that relapse, as a general rule, promptly follows all operations of this kind, however early or skilfully executed. A return of the disease is an inevitability; a mere matter of time, sooner in some cases, later in others. No surgeon can with any certainty specify the period. I doubt whether in the majority of instances it exceeds five or six months; some do not reach half that period; and very few go beyond a year. In one of my cases the malady recurred in less than three weeks, notwithstanding the most patient and thorough dissection, and the most assiduous attention during the after-treatment. The woman, aged forty-four years, the subject of scirrhus for eight months, died in great agony three months after the operation.

If it were possible to credit the statistics that were published in the latter part of the last century and in the early part of the present by Hill, Nooth, and others, we should be compelled to conclude that the extirpation of carcinomatous breasts was one of the most successful of operations. The former of these writers announced, in 1770, that he had had, up to that time, 88 cases, of which 40, whose breasts had been removed upwards of two years, were then alive and sound. In 9 cases the disease had broken out afresh, 2 were not cured, and in 1 a relapse was threatened. The results of the operations of Nooth, as given in his work on Cancer of the Mammary Gland, seem to have been still more favorable; for of 146 cases only 5 are reported as having been unsuccessful!

On the other hand, Dr. Monro, of Edinburgh, in 1742, asserted that he had witnessed nearly 60 cases of excision of cancer of the breast, and of these only 3 remained free from the disease at the end of two years. Dr. John Macfarlane, in 1838, published the results of 32 cases that had occurred in his own practice, in not one of which the cure was permanent. Of 86 additional cases, communicated to him by different surgeons, the issue was equally unfortunate; and the same is true of the cases, 98 in number, reported by Professor Benedict, of Breslau. In the majority of these cases the knife was used at an early period; the affected structures were most thoroughly removed, and in many of the patients there was no evidence whatever of constitutional deterioration; and yet in every one the malady returned, either externally or internally, and gradually proved fatal.

The results of the experience of Monro, Macfarlane, and Benedict have been fully confirmed by those of a more recent period, and they conclusively show the utter worthlessness of the statistics of Hill, Nooth, and others, who were either bad observers or men of no veracity. To sum up the whole matter, it may confidently be asserted that the knife, if it does any good at all, is only a means of temporary relief, generally, indeed, of a very transient character.

But, although an operation may not often materially prolong life, nay, perhaps sometimes even do harm in hurrying on the fatal issue, there are, nevertheless, in my judgment, valid reasons for its occasional performance. No one can doubt that in cases strictly exceptional, such, for example, as those previously alluded to, extirpation may be followed by the happiest results, not only ridding the part of pain but enabling the patient to live in entire comfort for many years. That some of these cases would, if left to themselves, terminate fatally much sooner than if subjected to operation is extremely probable. In one of my own, presently to be mentioned, the most remarkable on record, as far as the tendency to recurrence of the morbid growth was concerned, there can be no reasonable doubt that the woman would have died long ago if it had not been for the persevering employment of the knife. Who, among a given number of cases, can foretell which may be the lucky exceptional one?

Operative interference, it seems to me, is proper when, as not unfrequently happens, the patient's mind, filled with gloomy foreboding, is in a state of constant depression and despondency. Here the knife acts as a cordial; hope is revived, new life springs up, and, for a while at least, there is relief from suffering.

Extirpation is occasionally performed simply with a view to bodily palliation, as when the system is racked with pain, and worn out from the want of appetite and sleep. Or, it may be, the patient is rapidly sinking under the effects of hectic irritation and the profuse and foul discharge which so often accompanies an open cancer. The very air she breathes is poisoned by the effluvia of her apartment. No one will deny that the removal of a breast, in such an event, would not be proper, even if it should be attended with some risk to life. The tumor is excised; pain and discharge cease; appetite and sleep return; even hope is temporarily revived.

The most promising conditions for a favorable issue, as it respects the prolongation of life, are, the tardy growth of the tumor, the appearance of the disease after the fiftieth year, the partial enlargement of the gland, the normal condition of the nipple, the absence of lymphatic involvement, and the complete integrity of the general health.

No operation should be performed when the tumor is uncommonly small and circumscribed, not exceeding the size, for example, of an English walnut; when the disease, if not entirely dormant, is indisposed to spread; when the cancerous action is, to all appearance, strictly local in its origin; when the patient is after sixty or sixty-five years of age; and, finally, when there is no constitutional involvement. The united experience of the profession shows that a female, in such a condition, may live for years—sometimes, ten, fifteen, or even twenty—in comparative comfort, and ultimately die of some intercurrent malady.

Interference with the knife is out of the question when there are extensive ulceration of the tumor, great involvement of the lymphatic ganglions, firm adhesions, secondary formations in the skin or in some internal organ, a hereditary taint, extraordinary rapidity of development, and well-marked evidence of the cancerous cachexia. In such an event, an operation would only inflict additional suffering upon the patient, and tend to bring surgery into discredit.

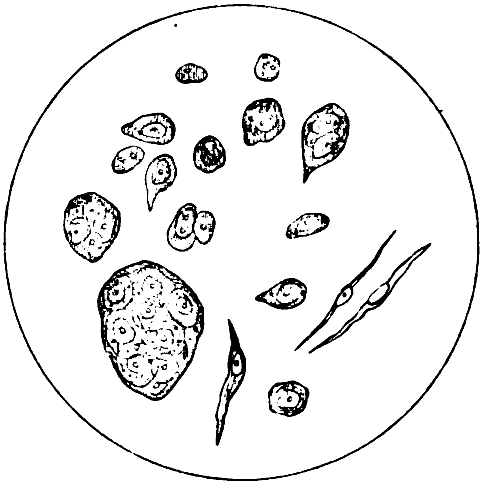
The period of *recurrence* after operation varies. The cases most favorable for prolonged immunity are those in which the disease is purely local, where there is no constitutional involvement, where the patient has passed the fiftieth year, and where there is no hereditary taint. Of 74 cases collected by Paget and Lebert, 55 relapsed before the end of the twelfth month, and two-fifths of that number from the first to the third month: 7 lived from one to two years, 3 from two to three, 1 from three to four, 2 from four to six, and 2 from six to eight.

The suffering consequent upon repullulation is said by some highly respectable authorities to be less than when the disease is permitted to pursue its natural course. This statement does not coincide with the results of my experience.

The disease, after removal, in the great majority of cases, returns either at the original wound, in the skin in the neighborhood of the cicatrice, in the axillary, subclavicular or cervical ganglions, or in some internal structure, as the pleura, lung, liver, or uterus.

Re-excision should be practised so long as the disease continues to appear at its original site; or, in other words, so long as it retains it local character, and does not infect the general system. The importance of this precept is strikingly illustrated in a remarkable case of soft cancer of the mammary gland that has been under my charge for the last five years, and the history of which is fully detailed in the chapter on malignant tumors. The patient, an unmarried female, aged forty-four, in 1857, became affected with a small swelling in the left breast, which was partially excised the following October. In May, 1859, when the case fell into my hands, I removed the entire gland. In September, 1861, I performed the twenty-third and last operation, a number having previously been performed by Dr. Asch, my former clinical assistant. Altogether fifty-two tumors were removed; they were of a soft, spongy, brain-like consistence, very vascular, and from the size of a small almond to that of a pullet's egg. They generally recurred at or near the former cicatrice, within a few weeks after extirpation, and speedily assumed a fungating appearance. The woman is now, three years since the last operation, in perfect health, without the slightest evidence of a return of disease. The microscopical characters of one of the tumors, removed at the sixth operation, are exhibited in the annexed cut, fig. 688, from a drawing by Dr. Packard.

Fig. 688.



Microscopical character of encephaloid of the mamma removed for the sixth time.

Velpeau relates a case of encephaloid of the breast in which he eventually effected a radical cure after three operations, the first having been performed when the woman was fifty-six years old. She remained perfectly well at the end of twelve years. All the tumors exactly resembled each other in structure and appearance. Roux was equally fortunate after six returns of the disease. Professor Knight, of New Haven, extirpated a scirrhous mamma from an old lady, who survived the second operation eighteen years, and finally died at the age of ninety-five.

Finally, I am not an advocate for removing cancerous breasts with *caustics*. Independently of the cruel pain which attends and follows their application there are few cases in which, unless the disease is exceedingly limited, they do not leave more or less of the morbid structures intact, and, consequently, in a condition for speedy outgrowth. The knife is always a more certain remedy, and in these days of anæsthetics there is no valid reason why it should ever give way to escharotics. Some surgeons are favorable to the employment of these substances on the ground that their application is accompanied with less hemorrhage than excision; this may be true, but it is equally true that there never need be much bleeding, however large or vascular the tumor may be, if proper care is exercised in its extirpation.

I do not think, however, that caustics should be altogether condemned in the treatment of cancer of the breast; for cases do occur in which they may be advantageously used as palliatives, for allaying fetor and improving the condition of the ulcerated surface. They are particularly adapted to the latter stages of the disease, when the period for extirpation is past, and when all that can be done is to render life a little more tolerable. The best articles for the purpose are the Vienna paste, butter of antimony, and chloride of zinc, applied while the patient is anæsthetized, and followed, if there be much pain, by a full anodyne.

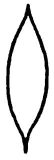
As to the *écraseur*, as a means of removing a carcinomatous mammary gland, I presume that no surgeon who has any self-respect could be induced to employ so barbarous an instrument for such a purpose. I can certainly not conceive of any case that would justify it.

EXCISION OF THE BREAST.

A certain amount of preliminary treatment is always necessary in excision of this organ. In most cases, there is marked disorder of the secretions, which should therefore be carefully corrected; the diet should be properly regulated; and the bowels should occasionally be opened by a mild laxative, as blue mass and rhubarb, or the compound cathartic pill.

The operation itself is generally a very easy and simple affair. It is only when the organ is much enlarged by disease, or when it is very vascular, that it is likely to prove annoying and embarrassing, especially if there is not a sufficiency of assistants. During its execution, the patient may either sit up or lie down; the latter posture I always prefer, as it gives us better control over the parts, at the same time that chloroform may be administered with greater safety.

Fig. 689.



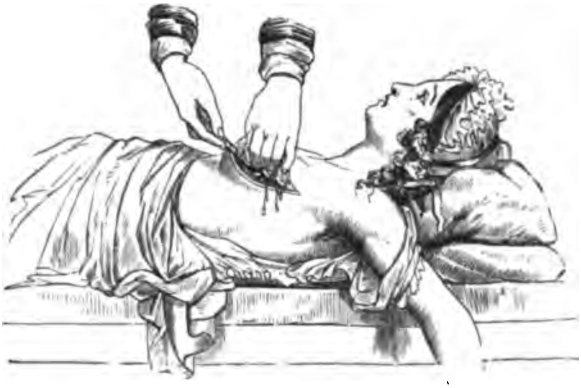
In most cases, it will be necessary to remove a portion of integument, particularly if the breast is at all large, or if there is any cutaneous involvement, either actual or impending. Hence the incisions, as shown in fig. 689, should usually be elliptical; and it will be well, if possible, always to make them in the direction of the fibres of the great pectoral muscle, as this will tend to facilitate both the liberation of the organ and drainage after the operation. The surgeon, however, is not always able to control this matter, owing to the peculiar condition of the parts, and he will, therefore, occasionally be obliged to make his incisions very oblique, or, indeed, almost perpendicular. In all cases an attempt should be made to save enough integument for the easy closure of the wound; for I deem it a matter of great moment that as much of it as possible should be healed by the first intention, convinced that such a result will be much less likely to be followed by speedy relapse than when the parts are permitted to gap.

The integuments being properly stretched, and the arm held off nearly at a right angle from the body, the knife is thrust through the skin and cellulo-adipose tissue, and carried round the diseased mass in such a manner as to include every particle of it, the lower incision being always made first. The dissection is then performed in the direction of the fibres of the pectoral muscle, which should be thoroughly exposed by the removal of its aponeurotic envelop. If any arteries of considerable size spring, they should immediately be compressed by the finger of an assistant, and carefully tied as soon as the operation is over, together with any of the smaller branches that might afterwards become a source of hemorrhage. When the tumor is inordinately vascular, it may be prudent to ligate each vessel as soon as it is divided, but this is generally an awkward and unnecessary proceeding. Before the parts are approximated, the wounded structures are examined with the greatest care, in order that not the slightest particle of the morbid substance may be left. Indeed, the very atmosphere of the disease should be removed. The fact that the tissues around the tumor, although apparently perfectly healthy, are often infiltrated with cancer cells, has been demonstrated by numerous observers, and is too important to be overlooked in an operation of this kind.

Copious hemorrhage will be most likely to attend this operation when it is performed on account of encephaloid, or of large scirrhous tumors which have formed strong and extensive attachments to the surrounding and subjacent structures; even then, however, it may always be readily controlled by the pressure of assistants until the morbid mass is completely liberated.

The adjoining sketch, fig. 690, affords a correct illustration of the position of the patient in this operation, of the lines of the incisions, and of the mode of separating the morbid mass.

Fig. 690



Excision of the breast.

If any of the lymphatic ganglions in the axilla are involved, they should be dealt with in the same manner as the breast itself, either by an extension of the outer angle of the incision, or by an incision immediately over the affected structure, which is then generally readily enucleated with the finger or the handle of the scalpel. This is often the most difficult and dangerous part of the operation, especially when these bodies are much enlarged, very numerous, thoroughly matted together, or closely hugged by the axillary artery and vein. If, in such an event, the point of the knife is used, very serious mischief will be likely to be done.

My rule, generally, in excision of the mammary gland, is not to approximate the parts until four or five hours after the operation, lest secondary hemorrhage should arise, and thus necessitate the removal of the dressings. The wound should be covered, in the interval, with a light, soft cloth, frequently wet with cold water. Care should be taken to use only a few stitches, and to press the flaps well down with long narrow strips of adhesive plaster, aided by a compress and a bandage, carried round the upper part of the chest. The arm should either be supported in a sling or secured to the side of the chest; the treatment should be gently antiphlogistic; and the dressings should not, as a general rule, be disturbed until the end of the third day, except in very hot weather, when it may be necessary to remove them sooner. When there is a want of integument, or injurious tension, it will be well, in the former case, to borrow a sufficiency from the neighboring parts, and, in the latter, to ease the flaps by suitable incisions, practised a short distance from the edge of the wound.

Any tendency to bagging should at once be counteracted by a free incision at the most dependent portion of the flap. Experience has shown that retained secretions soon become a source of irritation, provoking fever, erysipelas, and phlegmonous abscess.

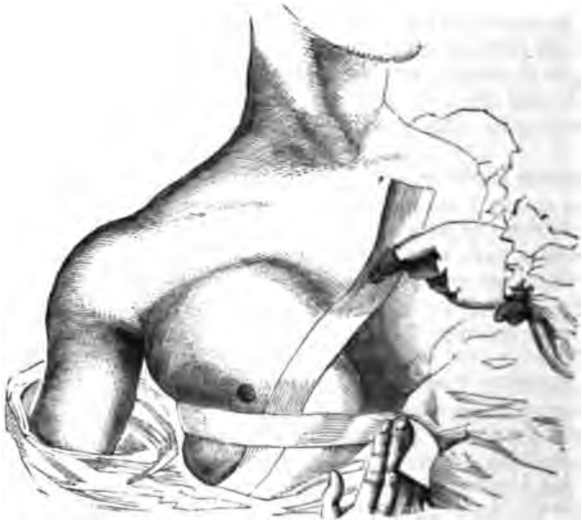
When the wound is healed, the parts should be well protected with a thin satin quilt, or a tanned rabbit skin, especially during cold weather; all pressure from the clothes should be prevented; and the corresponding arm should be constantly carried in a sling, to relieve the chest and shoulder of the weight of the limb.

Very few women perish from the effects of this operation in private practice. Among hospital subjects, however, a fatal termination is by no means uncommon. Of 235 cases of excision of cancerous and other diseased breasts, analyzed by Paget, 23, or ten per cent., died. Velpeau lost 32 in 167, or 1 in 5¼. The chief danger is from erysipelas, which occasionally occurs despite the greatest care both of the patient and of the surgeon. Death may also arise from pleurisy, pneumonia, pyemia, and diffuse suppuration. Fat, portly women, with large breasts, do not bear the operation as well as the more common class of subjects; very nervous ones also sometimes run great risk. In general, however, the case proceeds favorably; much of the wound often unites by the first intention; and the cicatrization is usually completed in from three to four weeks.

BANDAGES FOR THE BREAST.

The breast, like other organs, demands, when diseased, proper rest and support. The duty of the surgeon is very imperfectly discharged if he does not attend to these important points. For ordinary purposes the organ may be easily sustained with a light silk handkerchief, thrown round the opposite shoulder, and so arranged as to make equable pressure. When greater nicety is required, a special apparatus may be used, consisting of a silk or gum-elastic web, adapted to the shape and size of the gland, and secured to the trunk by shoulder-straps and a body-piece, the mode of construction and application being similar to those of the suspensory bandage for the scrotum. A beautiful contrivance of this kind is made in this city at the Nurses' Home.

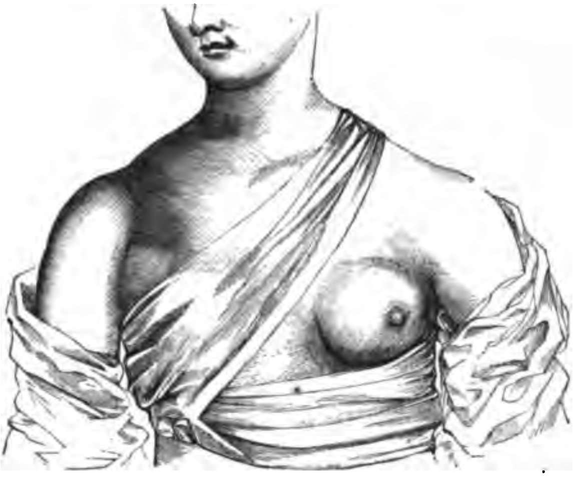
Fig. 691.



Mode of supporting the breast by strapping.

Sometimes the object may be advantageously attained by means of two broad adhesive strips, carried loosely across the breast, as in fig. 691; or by splitting a piece of old linen into two tails, one of which is fastened round the body, while the other is passed over the shoulder, thus supporting the organ in the form of a sling, as exhibited in fig. 692.

Fig. 692.



Sling for the breast.

DISEASES OF THE BREAST IN THE MALE.

The mammary gland of the male, although existing only in a rudimentary state, is liable to the same diseases, benign and malignant, as that of the female, but only, as experience has shown, in very rare instances. The most frequent affections here, according to my observation, are hypertrophy, induration, and neuralgia, which, indeed, are generally associated, and are sufficiently common to render them objects of great practical interest. In 1859, not less than three cases of these diseases were at the same time under my care at the clinic of the Jefferson Medical College, all the patients being young men otherwise in good health. In each the organ was very hard, decidedly enlarged, remarkably tender on pressure, and the seat of sharp, darting pains, liable to frequent exacerbations. Occasionally both glands are involved, but, in general, the malady is limited to one.

The *treatment* of these several affections must be conducted upon the same principles as in cases of mammary neuralgia, or irritable breast in the female. In general, however, the result is anything but satisfactory; for, although temporary amelioration may soon follow, it is only after a long time, and after frequent relapses, that permanent relief is obtained. The most reliable remedies are quinine, arsenic, and strychnia, with a minute quantity of bichloride of mercury, aided by occasional leeches, and the use of sorbefacient and anodyne plasters.

Abscesses sometimes form in the mammary region of the male, either in the substance of the gland immediately below the integuments, between the gland and the pectoral muscle, or beneath the latter, especially when the suppuration has been provoked by external violence, as a fall or blow. The diagnosis is generally easy, and the treatment sufficiently obvious.

The breast of the male has been found to be enormously *hypertrophied*, forming a large, heavy mass, at the front and side of the chest. It is also occasionally the seat of adenoid, fibro-plastic, and encysted *tumors*. The adenoid and fibro-plastic growths sometimes ulcerate, throwing out fungous, cauliflower-like excrescences, which, independently of their alarming appearance, are more or less painful, and the seat of a fetid discharge. The proper remedy is extirpation.

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and a dose of castor oil, and the little patient made an excellent recovery. Such a tumor might be laid freely open, and mopped with tincture of iodine.

Scirrhus sometimes affects the mammary region instead of the mammary gland, its most common site being the space between the outer and lower border of the breast and the axilla. I have seen several instances of this kind, in which the organ in question remained completely intact, from the commencement of the disease to its termination in death. The malady begins apparently in a lymphatic ganglion in this situation, from which it gradually extends in different directions until, at length, an immense tumor is developed, possessing all the characteristics of scirrhus. In a case recently under my observation, in an Irish female of seventy, both sides were implicated, though not in an equal degree. The disease was first noticed in the form of a small lump, two years previously, while on her voyage from Europe to this country. She suffered excruciating pain of a sharp, lancinating nature, and her general health was rapidly declining, with a tendency, on the part of one of the tumors, to ulceration. In none of the cases of this disease that have come under my observation was there any involvement of the axillary lymphatic ganglions, though it is easy to suppose that such a complication might arise during the progress of the affection.

Other morbid formations, as encephaloid, keloid, epithelioma, and chronic abscesses, are liable to occur on various parts of the chest, but, as they present nothing peculiar, they require no special notice here.

GENERAL DIAGNOSIS OF MAMMARY TUMORS.

The diagnosis of the affections of the mammary gland is not only exceedingly important but often very difficult and embarrassing. Many a breast has been sacrificed under the supposition that it was affected with cancer when it was merely laboring under chronic abscess or induration dependent upon neuralgia, inflammation, or lobular hypertrophy.

The diseases that are most liable to lead to error in diagnosis are, among the benign, chronic abscesses, neuralgia, hypertrophy, sero-cystic growths, and fibrous tumors; among the malignant, scirrhus, encephaloid, and colloid.

There is no possibility of confounding an acute abscess with any other disease. Its occurrence during early lactation, its rapid progress, the severity of the concomitant pain, the great swelling, the sympathetic disturbance of the system, and, lastly, the discoloration of the skin with the sense of fluctuation as the matter nears the surface, are always sufficient to distinguish its true character.

In *chronic abscess* most, if not all, of the above symptoms are wanting. The disease, usually beginning in several hard nodules, is the work of weeks, if not months; there is increased size of the organ but no swelling, properly so called; the part has no unnatural heat; there is no discoloration of the skin, not even when the attack is of long standing; instead of pain, there is merely a sense of soreness or of weight; and the general health is not materially disordered. Marked enlargement of the subcutaneous veins generally exists, especially in protracted cases, and may, unless great caution is exercised, be mistaken for that which so constantly attends confirmed encephaloid.

Neuralgia occurs early in life, generally from the eighteenth to the thirtieth year, and is usually associated with dysmenorrhœa and neuralgia in other parts of the body, especially of the chest and abdomen. The breast is not materially, if at all, enlarged, but it is exquisitely tender on pressure, and several small nodules, hard, circumscribed, and perfectly movable, are imbedded in its substance. They occasionally acquire a considerable bulk, especially if some of them coalesce. The general health is more or less impaired, and the patient is very nervous, often hysterical, and remarkably susceptible to atmospheric impressions. The nipple and axillary glands remain unchanged.

Hypertrophy, especially the partial variety, might be mistaken for scirrhus or encephaloid. The extraordinary bulk of the tumor, the natural appearance of the nipple, the absence of lymphatic involvement, and the lobulated character of the breast, together with its pediculated configuration, caused by the manner in which it is dragged away from the chest, readily distinguish general hypertrophy from other affections. The subcutaneous veins are always excessively enlarged and tortuous. Partial hypertrophy usually presents itself in the form of a small tumor or nodule, either single or multiple, rolling under the finger, quite firm, more or less sensitive, and unaccompanied by any decided increase of bulk of the breast.

The *sero-cystic* tumor, most common between the twentieth and fortieth year, is characterized by the tardiness of its progress, by a sense of fluctuation, by the absence of pain and lymphatic disease, by the natural appearance of the nipple, and by the unimpaired state of the general health. In the multilocular form of the affection the diagnosis is sometimes very obscure, especially in its earlier stages; there is less distinct fluctuation than in the unilocular cyst; and the tumor has a more solid and heavy feel.

Hydatids of the breast are very uncommon, and their diagnosis does not differ materially from that of the sero-cystic growth. More or less fluctuation necessarily exists; and, when the tumor is occupied by several bodies of this kind, a distinct fremitus, or friction sound, not unlike the creaking of new sole leather, may sometimes be elicited by rubbing the surface with the finger. When ulceration occurs, the microscope may detect the hooklets of broken-down echinococci in the discharges.

The *lacteal* tumor is recognized by its globular or ovoidal shape, its fluctuating feel, its rapid development, and its supervention upon delivery. Instead of pain there is a sense of distension or of uneasiness, and the general health is unimpaired. The tumor often acquires a large bulk in a short time.

Fibrous, adenoid, and lymphatic tumors are not always easily distinguishable either from each other or from other affections. In general, however, their slow development, the absence of adhesions and of lymphatic involvement, the normal appearance of the nipple, the firm elastic character of the swelling, and the integrity of the general health, will suffice to determine the diagnosis. All these growths are peculiar to young subjects. In the adenoid tumor, the morbid mass is sometimes remarkably lobulated, and, consequently, feels as if it consisted of numerous nodules connected by cellulo-fibrous tissue.

Of the malignant affections of the mammary gland the only ones requiring any special notice, in a general diagnostic point of view, are scirrhus and encephaloid.

Melanosis usually occurs in small nodules, situated partly in the breast, and partly in the cellulo-adipose tissue, of a rounded or ovoidal figure, of a dense consistence, and of a black color, often distinguishable through the skin. The disease generally coexists with melanosis in other structures.

There are no reliable signs of *colloid*. The tumor is hard, inelastic, heavy, globular, or ovoidal, somewhat smooth upon the surface, and tardy in its growth, but capable of attaining a large bulk. The diagnosis is based mainly upon the principle of exclusion.

The differential diagnosis of scirrhus and encephaloid will be most easily understood if exhibited in tabular form.

SCIRRHUS.	ENCEPHALOID.
1. Seldom seen until after the fortieth year.	1. May occur at any time after puberty.
2. Generally begins in several small, hard, circumscribed nodules.	2. Usually begins as a single tumor or diffused mass.
3. Increases slowly, and is occasionally almost stationary.	3. Extends rapidly, and never stops in its career.
4. The breast is seldom much enlarged, except when there is an unusual quantity of fatty matter around it.	4. Great bulk is one of the characteristic features of encephaloid.
5. The tumor is hard, firm, incompressible.	5. The breast is soft and elastic, feeling, at certain points, as if it contained a fluid.
6. Retraction of the nipple is an early and prominent feature.	6. The nipple often retains its natural appearance, even late in the disease.
7. The breast, early in the disease, contracts firm and extensive adhesions to the surrounding parts.	7. Adhesions also form, but not until late, and then they are seldom very extensive.

SCIRRHUS.	ENCEPHALOID.
8. The axillary lymphatic ganglions are always seriously involved during the progress of the disease.	8. The ganglions rarely suffer until after ulceration sets in, and even then often very little, if at all.
9. There is no marked enlargement of the subcutaneous veins.	9. The vessels under the skin are always greatly enlarged, and sometimes very tortuous.
10. The pain is sharp, or lancinating, and begins early in the attack.	10. The pain is dull or obtuse, and seldom considerable, until ulceration begins.
11. The ulcer has an excavated appearance, with steep, hard, everted edges, and a foul bottom.	11. The ulcer is fungous, its edges are thin and partially undermined, and the bottom is red and soft.
12. The discharge is thin and sanious, or sero-sanguinolent, and never very copious.	12. Is always very abundant, bloody, or sero-sanguinolent, like the washing of meat, and of a nauseous, almost insupportable odor.
13. There is seldom any decided bleeding, except when a vessel of considerable size is eroded.	13. Hemorrhage is frequent, and often very copious and exhausting.
14. The general health rarely suffers seriously until late.	14. Early constitutional involvement and cancerous cachexia.
15. Secondary scirrhous tubercles frequently form in the skin of the breast in the last stage of the disease.	15. No such appearances are witnessed in encephaloid.
16. The patient lasts, on an average, from eighteen months to two years and a half.	16. Death usually occurs in from nine to twelve months.

The distinction between ordinary solid tumors of the breast and the malignant formations to which this organ is liable, although not always very easy, may generally be satisfactorily established, provided the exploration is conducted with the requisite care and attention. The chief diagnostic differences are the following:—

Non-malignant mammary tumors are most common from the twentieth to the fortieth year; they are irregular in shape, lobulated, of unequal consistence, more or less movable, tardy in their development, and seldom tending to ulceration. There is no retraction of the nipple; the skin retains its natural color, but is often sensibly attenuated; there is no enlargement of the subcutaneous veins, except in extensive hypertrophy or cystic disease; the axillary and supraclavicular glands are unaffected; there is frequently a feeling of weight or distension, but seldom any actual pain; and the general health is little, if at all, impaired. In cystic affections, there is always some degree of fluctuation, and the insertion of the exploring needle is followed by an escape of serous or sero-sanguineous fluid. Non-malignant tumors incommode by their weight and bulk, but seldom prove fatal.

In malignant growths the symptoms are completely reversed. The disease, especially in scirrhus, is seldom observed until after the fortieth year, and always advances rapidly. The tumor, of extraordinary hardness, and of uniform consistence, soon loses its mobility, and, gradually approaching the surface, ultimately breaks out into an open intractable ulcer. The skin is discolored and indurated; the subcutaneous veins are greatly enlarged, particularly in encephaloid; the nipple is retracted; the axillary lymphatic glands are more or less implicated; the pain, at first slight and occasional, soon becomes constant, and is of a sharp, lancinating character; the health suffers severely; and the countenance exhibits the peculiar cancerous cachexy. The disease is invariably fatal, the period at which death occurs varying from twelve months to two years and a half. Rapidity of growth and inordinate bulk should always excite suspicion of malignancy, especially if associated with great enlargement of the subcutaneous veins and marked failure of the health. A bloody, sanious, or ichorous discharge from the nipple is generally a sign of ill omen. When ulceration exists, a particle of the diseased structure may be chipped off, and examined microscopically with a view to the detection of cancer cells.

CHAPTER XX.

DISEASES AND INJURIES OF THE EXTREMITIES.

GUNSHOT WOUNDS.

Gunshot wounds of the extremities are of frequent occurrence in time of war, and commonly require much judgment for their successful management, as they involve every possible grade of injury from the most insignificant scratch to the most appalling mutilation. The collapse is often so great as to cause death, either immediately or within a very short period after their receipt, the system, perhaps, never making the slightest effort at reaction. In the inferior extremity the shock and danger to life are always proportionately greater than in the superior, gunshot wounds and fractures sharing, in this respect, the same fate as common wounds and fractures. These effects increase in a marked degree as the injury approaches the trunk, precisely as in amputations, those of the foot and leg being attended with much less risk than those of the thigh and hip. During the war in the Crimea, the ratio of mortality after amputations for gunshot lesions was, in round terms, 14 per cent. for the foot, 22 for the ankle-joint, 30 for the leg, 50 for the lower third of the thigh, 55 for the middle third of the thigh, and 86 for the upper third of the thigh, all amputations of the hip-joint having proved fatal.

Gunshot injuries of the extremities may, very properly, be arranged under the following heads, according to the nature of the parts involved: 1st, Wounds simply or mainly of the muscles; 2dly, wounds of the vessels; 3dly, wounds of the nerves; 4thly, wounds of the joints; and, 5thly, wounds of the bones.

1. *Wounds of the Muscles.*—Gunshot wounds of the muscles, or simple flesh wounds, are not, in general, of themselves dangerous, even when of large extent, but they may readily become so when they occur in a person of intemperate habits or impaired constitution, or even when the health was excellent at the time of the injury, from exposure, fatigue, or improper management. Erysipelas will then be very liable to arise, followed by high excitement, and by the formation of large abscesses, the pus often burrowing extensively among the surrounding structures; ordinarily, however, such injuries will, for the most part, do well, the patient making a rapid recovery with a good use of the limb. Of upwards of three hundred cases of flesh wounds of the upper and lower extremities which I saw after the battle of Bull Run, very few died. Indeed, most of the men were able in a short time to return to duty. Shell wounds of the muscles are usually more dangerous than wounds made with rifle balls. In the hospital at Georgetown, I saw a man, aged thirty-eight, who died at the end of seven days from a frightful wound on the outside of the thigh, at least ten inches in length by four in width, caused by the bursting of his musket. As an offset against this case, I may mention one which occurred during the Mexican war, in a young private of the 2d Kentucky Regiment, who made an excellent recovery, although it would be difficult to conceive of a more terrible flesh wound. Here the muscles of the right hip and of the outer and back part of the thigh, as low down as the popliteal space, were almost entirely torn away by a shell, which at the same time denuded the head of the femur and the femoral artery, the pulsations of which were distinctly perceptible at the inner side of the limb. Notwithstanding this horrible mutilation, rapid recovery took place, and when I saw the man, three months after the accident, the parts were nearly cicatrized, without much impairment of function.

Flesh wounds of the shoulder and back, inflicted by gunshot, are not, in general, dangerous. Of twenty-six men belonging to one of the Kentucky regiments, who were injured in this situation at the battle of Buena Vista, in 1847, not one died. The ball in nearly all had penetrated the deltoid muscle, and, passing upwards over the shoulder, lodged in the neck and back, from which it was afterwards extracted.

The *treatment* of such injuries resolves itself into the removal of foreign matter, and the use of water-dressing, with rest and elevation of the limb, and attention to the diet, bowels, and secretions. The eschars, if there be any, will usually separate in five or six days, followed by healthy granulations, and there will seldom be any necessity for dilating the parts, unless there should be excessive tension, as when they are invaded by erysipelas, or when matter forms and threatens to burrow among the neighboring structures.

2. *Wounds of the Bloodvessels.*—The large vessels suffer much less frequently in gunshot wounds than might at first sight be supposed, their great resiliency enabling them to glide out of the way of the flying missile. An instance has been recorded by Mr. Guthrie in which a ball passed between the femoral artery and vein without dividing either. The fact is, this class of injuries is comparatively exempt from copious hemorrhage. It is only when a large artery or vein is perforated that the patient, unless promptly succored, will be likely to bleed to death. Sometimes a vessel, instead of being opened, is merely contused and slightly lacerated, the ball grazing its coats, which, inflaming, may ultimately give way, and thus lead to troublesome, if not destructive, hemorrhage. Such an event, which it is not always in our power to foresee, but which may reasonably be anticipated when the missile has passed in the direction of a large artery without having occasioned any serious bleeding, is most liable to occur from the sixth to the eighth day, and is always greatly to be deplored, inasmuch as, arising at a period when it is not expected, it may prove fatal before the necessary assistance can be rendered. It is, therefore, highly proper, in all such cases, to keep the limb for several days constantly encircled with a tourniquet, the use of which should be fully explained to the patient and his attendants, so that there may be no serious loss of blood in the absence of the surgeon.

A vessel, grazed by a ball, does not always, unless devitalized, give way under the effects of its injuries; on the contrary, the wounded part is often successfully repaired, or the canal at the site of the mischief is permanently obliterated by the formation of a clot.

The causes of secondary hemorrhage in gunshot wounds of the extremities are, 1st, injury inflicted upon the vessels by the missile, or by a sharp spiculum of bone; 2dly, the premature detachment of the clot, in consequence of sudden and violent bodily exertion, attended with great increase in the force and rapidity of the heart's action; and, 3dly, a want of plastic power in the blood, dependent upon the hemorrhagic diathesis, or the effects of an inadequate supply of vegetable food. The period at which the bleeding thus occasioned sets in varies, on an average, from five to twenty days.

The *treatment* of a wounded artery consists in exposing it at the seat of the injury, and applying two ligatures, one above and the other below the opening. This should be done as speedily as possible after the accident, before there is any considerable inflammation or swelling. Tying the vessel at its cardiac side alone will not suffice; unless it is secured also at its distal extremity, hemorrhage from the recurrent circulation will be inevitable. The operation should be performed even when all bleeding has ceased, especially if the patient is obliged to be transported to any distance. Venous hemorrhage may generally be effectually arrested by compression; the ligature should be employed only in the event of its failure.

When the wound involves the principal artery and vein of a limb, amputation will generally be required, in anticipation of the mortification which is so liable to occur in such an event from the interruption of the circulation. The operation, in fact, is sometimes demanded even when only one of these vessels is severely injured.

3. *Wounds of the Nerves.*—Unless the nerve is very large, a gunshot wound of it will not be likely to eventuate in any trouble, beyond a slight temporary paralysis or loss of sensation. Under opposite circumstances, however, the mischief may be very great; for then there may be, in addition to these effects, danger of mortification from the interruption of the nervous fluid, just as a limb may perish from the want of blood when its main artery has been divided. The mortification, in such a case, may be direct—that is, it may be caused by the mere suspension of the nervous power of the parts—or indirect, through the medium of inflammation; the latter being the more common. Occasionally a gunshot wound of the nerves is followed by severe neuralgia, lasting, perhaps, for years, if not during the remainder of life.

In the English army in the Crimea, only 23 cases of gunshot wounds of the brachial plexus and larger nerves, as the median, ulnar, and sciatic, are reported to have occurred; of which 9, or 41 per cent. of the whole, proved fatal. The cause of death in 5 of the cases was tetanus. Partial division of the nerves was sometimes followed, especially in the upper extremity, by total loss of sensation and power, which, though occasionally recovered from, often ended in atrophy, or atrophy and contraction of the muscles, with permanent disability of the limb.

Valuable light has recently been thrown upon many of the more remote effects of gunshot injuries of the nerves by the observations of Dr. S. Weir Mitchell and his colleagues, Dr. Morehouse and Dr. Keen, at the Army Hospital for Diseases of the Nerves, in this city. Among the more remarkable of these effects, some of them very imperfectly, if at all, heretofore described, are the changes which the skin and its appendages undergo from the impairment of their nutritive function. The skin is shrunken, glossy, discolored, partially deprived of cuticle, and so exquisitely sensitive as to render it intolerable to the slightest touch. These phenomena are particularly conspicuous in the hands and fingers; they also occur, but less distinctly, in the feet and toes. The skin looks as if it were tightly stretched; little spots, or patches, of a reddish, purple, or bluish color, exist upon its surface; and it is not uncommon to meet with minute cracks, fissures, and vesicles, similar to those observed in eczema. Conjoined with these affections are generally loss of hair and incurvation of the nails, the latter being often so remarkable as to be almost pathognomonic of this class of injuries. Ulcerations, of an obstinate, painful character, often exist at the angles of the nails, and add greatly to the patient's suffering.

The joints are often swollen, stiff, tender, and painful; the tissues around are indurated, from interstitial deposits; and troublesome, if not permanent, anchylosis frequently ensues.

Among other phenomena noticed by Dr. Mitchell is a remarkable burning pain in the hands and feet, especially on the palmar surface of the former, and the dorsum of the latter; coming on at a variable period after the receipt of the injury, lasting for a longer or shorter time, and generally referred to the skin or superficial structures. It varies in degree from the most trivial burning to exquisite torture. It is aggravated by exercise, by dependency of the part, and by exposure to heat and dry air, but relieved by cold and moisture.

When these affections exist in a high degree, they are always attended with marked disorder of the constitution, loss of sleep and appetite, derangement of the secretions, irritable temper, and excessive impressibility to atmospheric vicissitudes. They may be caused apparently by the most simple hardly less than by the most severe injuries. In many cases they follow upon the most trivial contusions.

It is not always easy to decide upon the proper course of *treatment* in gunshot wounds of the nerves. In the milder cases, the same plan should be adopted as in common flesh wounds. If the nerve is completely, but irregularly, divided, or much contused and lacerated, the safest procedure will be to cut off its ends smoothly, and to tack them nicely together with the silver-wire suture, hoping for ultimate reunion through the agency of plastic matter; but, if the intervening space is considerable, such treatment would, of course, be improper. If the main nerve of a limb is completely severed, amputation may be required, especially when the injury is complicated with lesion of an important vessel; but, even then, the surgeon should greatly hesitate before he undertakes so terrible an operation.

For the more remote effects of these injuries much may be done by attention to the general health, the use of tonics and alterants, change of air, and the correction of the secretions. The burning pain and hyperæsthesia of the skin are most effectually relieved by thorough vesication, first with liquid ammonia, and afterwards with cantharides, along with hypodermic injections of morphia, and cold water-dressing. Dr. Mitchell has found all other means, both local and constitutional, perfectly inert and unreliable. In some of his more obstinate cases he was obliged to employ as many as six, eight, or even ten blisters before he was able to make any very decided impression upon the disease.

4. *Wounds of the Joints.*—The gravity of gunshot wounds of the joints has been recognized by all practitioners, military and civil, since the invention of firearms. The principal circumstances influencing the prognosis are the size and complexity of the articulation, the extent of the injury, and the state of the system and previous health of the patient. A gunshot wound of a ginglymoid joint is, in general, more dangerous than one of a ball-and-socket joint, and a gunshot wound of the hip, knee, and ankle, than one of the shoulder, elbow, or wrist. The structures around the articulation often suffer severely, thus adding greatly to the risk of limb and life. Of 65 cases of gunshot wounds of different joints, related by Alcock, 33 recovered, but of these 21 lost each a limb. Of the 32 that died, no operation was performed upon 18.

Gunshot wounds of the smaller joints often do well, although they always require long and careful treatment. Lesions of this kind involving the shoulder are frequently amenable to ordinary means. If the ball lodge in the head of the humerus, it should be extracted without delay, its retention being sure to excite violent inflammation in the soft parts, and caries or necrosis in the bone, ultimately necessitating amputation, if not causing death. If the bone is at all shattered, the proper operation will be resection.

Gunshot injuries of the elbow generally do well under resection; it is only when there is extensive lesion of the soft parts, along with great comminution of the bones, that amputation will be likely to be required. Similar remarks are applicable to gunshot injuries of the wrist and carpal joints.

Gunshot wounds of the hip, knee, and ankle joints are always to be considered as serious accidents, very liable to be followed by loss of limb and life. The danger is a hundred-fold increased when there is severe involvement of the articular extremities of the bones. Gunshot wounds of the knee are the most dangerous of all. Of upwards of forty cases of this kind in the French hospitals in the Crimea, in which an attempt was made to save the limb, all, except one, proved fatal. Of nine cases which occurred in India, not one was saved. Guthrie never saw a gunshot wound of the knee-joint attended with severe injury of the bones, recover without removal of the limb; the experience of Larrey was of the same nature; and Esmarch declares, as the result of his observation in the Schleswig-Holstein campaigns, that all lesions of this description demand immediate amputation of the thigh.

Dreadful injury is sometimes inflicted upon a joint indirectly, as when a ball, passing through the extremity of a long bone, causes a fissure which extends through the synovial membrane. Occasionally the missile traverses a joint, channelling a groove into the articular cartilage, but not inflicting any serious lesion upon the integuments. Such accidents, although, perhaps, apparently insignificant, are often followed by the most violent inflammation, imperilling both limb and life. Patients sometimes perish from secondary involvement of a joint, its structures taking on fatal action in consequence of a severe wound in its immediate vicinity. Lastly, an articulation may suffer terribly from gunshot injury without any external wound, as when it is struck by a partially spent ball or shell. Under such circumstances, indeed, as has beeen shown by Ledran, Legouest, and others, a joint may be completely dislocated, and yet the integuments remain intact.

When, in the more violent forms of these articular injuries, an attempt is made to save the limb, the patient often perishes within the first three or four days, from the conjoined effects of shock, hemorrhage, and traumatic fever. If he survives for any length of time, large abscesses are liable to form in and around the joint, the matter burrowing extensively among the muscles, and causing detachment of the periosteum, with caries and necrosis of the bones.

From all, then, that precedes it may be assumed, as a general proposition, that, in the milder cases of these injuries, especially as they occur in the more insignificant joints, the ordinary precepts of conservative surgery should be enforced; whereas, under opposite circumstances, it will usually be necessary either to resect the articular extremities of the bones, or to remove the limb at a suitable distance above the seat of the injury. Excision is adapted chiefly to gunshot wounds of the joints of the superior extremity, while amputation is more frequently required in those of the inferior extremity. All large wounds of the knee-joint, or even comparatively small ones, if they involve the epiphysis of the femur or tibia, imperatively demand the latter operation; and few cases of gunshot injuries of the ankle will be likely to arise on the field of battle in which such a procedure would not be preferable to excision.

5. *Wounds of the Bones.*—The effects of balls upon the osseous tissues are subject to great diversity. In the first place, the injury may be very superficial, involving merely the periosteum or this membrane and a little of the compact substance of the bone; or, secondly, the missile may simply strike the bone, causing more or less severe concussion of its substance, without penetration, but yet inflicting a sufficient amount of mischief to induce violent inflammation, terminating in abscess, caries, or even necrosis; or, thirdly, the ball, as it courses along, may plough a groove into its surface, also liable to be followed by bad effects; or, fourthly, the vulnerating body may enter the bone, breaking and comminuting it, each fragment, as it is driven about among the soft parts, becoming thus an additional source of injury. The old round ball often glanced when it came in contact with a bone, but the Minié ball almost invariably perforates it, grinding it at a fearful rate, and so producing the very worst form of compound fracture.

The number of fragments is extremely variable; thus, there may, on the one hand, be only two, three, or four, or, on the other, as many as a dozen, twenty, or even thirty. Their size, too, is very indefinite. Some of the fragments may be entirely detached, while others may retain their connection with the main body of the bone, either by osseous tissue or through the periosteum.

A long bone, instead of being broken, may be simply perforated. Hennen relates two cases in which the shaft of the femur was thus pierced, and three cases are referred to by Esmarch, in which a similar accident befell the upper third of the tibia. The lesion has also been observed in the humerus, radius, and ulna.

A bone is sometimes terribly shattered by a large stone, struck and set in motion by a round shot, or a fragment of shell. Occasionally again, a severe fracture is produced by a ball in ricochet without any apparent injury whatever of the integuments, as in a case which I saw at Washington, in a sergeant of Rickett's Battery, who was struck in this way on the arm by a twelve pound shot, which broke the humerus at three different points, but did not even bruise the skin.

In the *treatment* of this class of injuries, the first object, if the limb can be saved, is to staunch hemorrhage, and to extract any loose splinters of bone that may be present. The wound should be thoroughly examined with the finger, the patient being of course under chloroform, and no efforts should be spared to place the parts in the best possible condition for early reunion. A superficial exploration is worse than useless. The work must be done thoroughly and promptly, otherwise the patient will be subjected to immense pain and suffering, if not to ultimate loss of limb and life. I am satisfied from what I have seen of such cases that these injunctions are frequently most shamefully neglected.

In the milder forms of the injury, the treatment must be conducted according to the ordinary rules of practice; by rest, elevation, and medicated water-dressing, conjoined, if necessary, with leeches and scarification, especially if erysipelas should arise. If the bone is severely broken and comminuted, resection or amputation will probably be required, and should be performed at once, as soon as reaction is sufficiently established. Gunshot fractures of the femur are particularly dangerous, especially when inflicted with the Minié ball, and frequently demand amputation on account of the frightful shattering of the bone, causing not only great shock, but, if the patient survives, rapid and extensive swelling of the soft parts, followed by copious infiltration of pus. In the Crimea, a bad compound fracture of the thigh was considered as synonymous with death; and the surgeons of the Black Sea Fleet never attempted to save a limb after such an injury, except at the risk of the patient's life. Stromeyer, in commenting upon the subject, declares that gunshot injuries of the shaft of the femur are among the most dangerous lesions of the bones, and he adds that they are particularly prone to end unfavorably when they are produced by a piece of exploded bomb or a grazing cannon ball, without division of the soft parts.

Numerous instances have occurred during the present war of recovery from gunshot fractures of the middle and upper-third of the thigh with a very useful, though generally a much shortened and deformed, limb. Not less than half a dozen of such cases occurred under my immediate observation at the George Street military hospital of this city; and hundreds of similar cases can attest the skill and attention of our army surgeons elsewhere. The most simple treatment alone is usually admissible in this class of injuries. Hardly any apparatus is required, beyond a few short splints at the seat of fracture, and two long, broad adhesive strips to secure the limb to the foot of the bedstead. Sometimes a long bracketed splint may advantageously be applied. Occasionally the limb may be suspended in a sling, or supported with a Smith's anterior splint; but, in general, the straight position will be found to be most comfortable to the patient and best adapted to a good union. The requisite degree of counter-extension may generally be readily made by simply elevating the foot of the bedstead. The wound must, in bad cases, be dressed at least twice a day, dead bone removed as soon as it is detached, and bagging of matter prevented by suitable counter-openings and the use of the bandage.

A remarkable instance of recovery of gunshot fracture of the thigh occasionally occurs when the condition of the limb is apparently in the most desperate condition. Of this description was the case of Lieut. Adams, detailed in the chapter on gunshot wounds. The injury could hardly have been more frightful, and yet he got well with a very useful limb. An example like this should certainly serve to admonish the military surgeon not to sacrifice indiscriminately every limb, even when the injury is apparently of the most hopeless nature; unfortunately, however, he cannot always, on the field of battle, carry out the dictates of his judgment; everything around him is unpropitious, and he is, therefore, often compelled to use the knife in cases which, under more auspicious circumstances, as it respects locality, air, nursing, and after-treatment, he might possibly have saved.

Gunshot fractures of the *patella*, unless attended with great comminution of this bone, and penetration of the knee-joint, do not necessarily require amputation. The cases observed by Hennen, Stromeyer, Tripler, and other military surgeons show that such accidents are often followed by excellent recoveries. Extensive laceration, on the contrary, of the ligament of the petella, with wound of the synovial membrane, will usually result badly if an attempt is made to save the limb.

Gunshot fractures of both *bones of the leg* are also, generally speaking, bad accidents; great swelling, followed by diffuse abscess, usually rapidly sets in, and, unless the patient is peculiarly fortunate, he will be very apt to sink under the effects of erysipelas, pyemia, osteomyelitis, or hectic irritation, not to say anything of the danger of mortification, which is often very great, especially when the bones are comminuted, at the same time that severe injury has been sustained by the soft parts. Gunshot fracture of the fibula alone is usually much less serious than similar injury of the tibia.

Gunshot fractures of the *tarsal bones* are generally grave accidents, liable, if an attempt be made to save the limb, to lead to very serious consequences, especially when the injury has been inflicted by a Minié ball or a piece of shell. I have seen several instances of the kind caused by the common round ball, which were promptly followed by tetanus and death, and such occurrences are by no means infrequent in military practice.

Gunshot fractures of the *arm*, *forearm*, and *hand* are, compared with similar lesions of the inferior extremity, in general, of a much less grave character, requiring, on the one hand, much less frequently amputation, and admitting, on the other, much oftener of resection. A great deal, of course, will depend, in every case, upon the extent of the comminution, and the amount of injury sustained by the more important soft structures.

A very terrible form of contusion is sometimes inflicted upon the upper extremity of artillerymen by the premature explosion of the gun in the act of loading; causing excessive commotion of the entire limb, horrible laceration of the soft parts, and most extensive infiltration of blood, accompanied, in many cases, by comminuted fracture, and penetration of the wrist and elbow joints. The constitutional shock is usually great. If an attempt be made to save the parts, diffuse suppuration, and more or less gangrene, will be sure to follow, bringing life into imminent jeopardy. The proper remedy is amputation, performed promptly at a considerable distance above the apparent seat of the injury, otherwise mortification will be apt to seize upon the stump.

Gunshot fractures of the extremities are often attended with frightful *hemorrhage*, in consequence of the injury sustained by the soft parts from the loose splinters which are often driven about in every direction. The blood may proceed altogether from the smaller vessels, and the amount effused may be such as to cause the most extensive infiltration of the areolar tissue, both beneath the skin and among the muscles; or a large artery or vein may be opened, producing great distension of nearly the entire limb, especially if there is accidental closure of the wound. The parts will be found, immediately after the occurrence, to be cold and numb, and of a remarkably pale appearance, soon succeeded by a mottled, purplish hue, and this, in turn, if the patient survives, by a greenish or brownish color.

When an attempt is made to preserve the limb, the first duty is to extract all the loose pieces of bone, and the second to place the ends of the fragments in accurate apposition, retention being afterwards effected in the usual manner. Special attention must be paid to drainage and cleanliness. Splinters, unless very small and sharp, that still retain a decided connection with the parts, whether by osseous matter or periosteum, should not be molested, as they will in all probability soon reunite, and thus afford important aid in the process of repair. If they are thrown off during the suppurating stage, it will be sufficiently easy to extract them through the sinuses in the soft structures. At all events, it will be well, in every case, not to be over officious; for by too much cutting and pulling an enormous amount of harm may be done, not only by causing improper waste of blood, but by interrupting nutrition, and permitting too free access of air.

When, in addition to serious injury of the bones, there is extensive infiltration of blood, the case may generally be regarded as a bad one, likely, if an attempt be made to save the limb, to eventuate in mortification. In the slighter forms of the accident, the blood will usually rapidly disappear under the use of the roller and of spirituous lotions.

In the treatment of gunshot wounds of the *carpus* and *metacarpus*, the greatest care should be taken to pick away every particle of loose bone, and to place such pieces as are retained in the most suitable position for accurate and speedy reunion. Unless this be done, the hand will become enormously swollen, numerous abscesses will form, and the soft parts will be so completely matted together by lymph and new osseous matter as to render them permanently stiff and useless

Similar measures should be adopted in the treatment of gunshot injuries of the tarsus and metatarsus.

If amputation be advisable, it must not be performed too near the seat of the injury, as the effects of the mischief often extend much farther than the eye can discern, especially when it has been inflicted by a shell or heavy ball. The proper time for performing the operation is the moment sufficient reaction has taken place.

AFFECTIONS OF THE NAILS.

The nails are liable to various kinds of injuries, as lacerations and wounds and also to certain diseases, either primary or secondary.

When a nail is torn away along with its root, perfect regeneration will, of course, be impracticable; a slight attempt at reproduction may occur, but nothing more. When the matrix remains, a new nail, generally as smooth and perfect as the original one, will in due time be formed. The period required for the development of the nail of the thumb, under such circumstances, is, according to my observation, about four months and a half, a few weeks less being required for the nails of the fingers.

Wounds of the nails may be transverse, oblique, or longitudinal. Whatever their direction may be, they possess the peculiarity of not being able to undergo any process of repair. The transverse and oblique wounds always disappear with the natural growth and extension of the nail, and the same thing happens when the cut is vertical, except when it extends through the entire matrix of the nail, when it invariably remains as a rough irregular fissure, causing more or less permanent inconvenience.

Contused and lacerated wounds of the nails are always excessively painful, and are liable to be followed by severe inflammation and even considerable suppuration. They should be treated in the usual antiphlogistic manner, with special attention to rest and elevation of the part. If matter form, an early opening should be made for its evacuation. The blood which is so often effused under the nail in external injury generally disappears spontaneously; should it cause painful pressure, an operation may be necessary.

Splinters of wood, pieces of glass, and other foreign bodies are liable to be forced under the nails, causing violent pain and severe nervous symptoms, followed, if not speedily removed, by a bad form of inflammation. Extraction may generally be easily accomplished with the common dissecting forceps, but I have sometimes found it necessary to make quite an extensive incision before dislodgment could be effected.

The nails are liable to be seriously affected by different mechanical occupations, as dyeing and tanning, becoming short, thickened, fissured, tender, and painful. In herpetic diseases they are often very short, scaly, and of a thick, rounded, button-like form. In Polish plait, the nails both of the fingers and of the toes sometimes acquire an extraordinary bulk, and a yellowish, livid, or black complexion. In strumous persons they are occasionally deeply grooved, enlarged, and of a firm, horny consistence; and the changes which they now and then undergo in tertiary syphilis are well known to every one.

Some of these affections admit of relief, while others are either partially or wholly incurable. In all cases, the first object should be to get rid of the exciting cause, when the morbid action will often disappear under the most simple applications. When the malady, whatever it may be, is at all obstinate, or of long standing, the local treatment must be conjoined with internal remedies, of which the most valuable are iodide of potassium and mercury, especially when there is a strumous or syphilitic taint. The best topical means are lotions of copper, tannin, chloride of zinc, and bichloride of mercury. The ointment of the oxide of zinc is also of great value, and in some cases signal benefit accrues from the dilute ointment of nitrate of mercury.

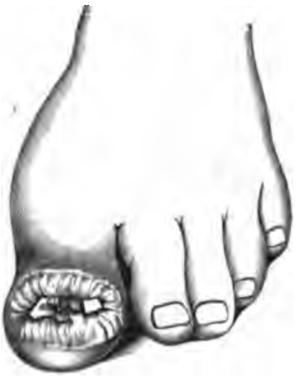
To keep the nails in a sound condition it is impossible to bestow too much attention upon them in the way of cleanliness and paring. It is the neglect of these precautions that entails so much disease upon them among the lower classes of people.

ONYXITIS.

Onyxitis usually begins in a small circumscribed swelling of the ungueal matrix, attended with more or less pain and discoloration of the skin. A narrow ulcer or cleft soon appears at the root of the nail, and gives vent to a thin, ichorous fluid. The sore gradually extends, until it finally involves the whole of the ungueal matrix, or even the entire nail. The surface has a foul, dirty aspect; the margin is thin and sharp; the discharge is irritating and offensive. The skin around the ulcer is indurated, tender, and livid; the nail is yellowish, brownish, or black, dry, and disfigured; and the affected member, often twice or thrice the normal size, has a peculiar bulbous appearance. In some instances the nail becomes loose, and ultimately drops off. The pain, which is generally slight, is occasionally so excessive as to deprive the patient of appetite and sleep for days and nights together. The disease is slow in its progress, and may continue for many months before it is arrested. Although not strictly of a malignant nature, its tendency is to destroy the affected nail, and to produce serious changes in the surrounding structures.

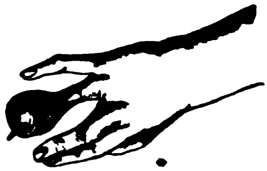
Onyxitis is most frequently met with in the great toe, thumb, and index finger. It occurs chiefly in scrofulous, ill-fed subjects, or in children whose system has been deteriorated by syphilis, before the twelfth year. External injury, as a bruise or puncture, may produce the disease, but in most instances it arises without any known cause. The general health often suffers in this complaint, and the secretions are almost always considerably disordered. The annexed drawing, fig. 693, from a clinical case, conveys an excellent idea of this affection as it occurs in the great toe, and fig. 694, from Druitt, as it shows itself in the finger.

Fig. 693.



Onyxitis of the big toe.

Fig. 694.



Onyxitis of the index finger.

The *treatment* of onyxitis is sufficiently simple. After the bowels have been cleared out, and the secretions re-established, the system should be brought under the influence of mercury, carried to the extent of slight ptyalism. The best preparations are calomel and blue pill, the latter of which is usually preferable, because it is more mild and gradual in its operation. It may be administered two or three times a day, in the proportion of three to five grains at a dose, with a small quantity of opium to prevent griping and purging. As soon as the gums become tender, the medicine must either be entirely withheld, or used at longer intervals, and in smaller quantity. The effects of the mercury, however, should be steadily maintained for several successive weeks, otherwise the disease will be sure to reappear, or to resume its original character. The local treatment should be of the mildest description. The sore should be washed several times a day with tepid water and soap, and its surface kept constantly covered with scraped lint, wet with a weak solution of chlorinated soda, creasote, nitric acid, or the compound tincture of myrrh and aloes. In several instances I have derived great advantage from the use of lime-water, containing two grains of bichloride of mercury and the same quantity of opium to the ounce. When there is much inflammation in the parts around the sore, the warm water-dressing, or an emollient poultice, will afford great relief. An ointment composed of two grains of arsenious acid and an ounce of spermaceti ointment occasionally acts almost as a specific. Now and then great benefit results from mercurial fumigation. As soon as the ulcer assumes a healthy aspect, the best application is the opium cerate. The nail should be well trimmed, but evulsion can answer no useful purpose, nor is it proper to amputate the affected part, unless, after the cure is effected, it is found, by its bulk or unseemliness, to interfere with the convenience and comfort of the patient.

SECT. I.—SUPERIOR EXTREMITY.

1. AFFECTIONS OF THE HAND AND FINGERS.

The hand and fingers afford frequent opportunities for surgical interference, on account of deformities which not only greatly mar their beauty and symmetry, but seriously impede the exercise of their functions. These defects may be either congenital or acquired, being the result of various kinds of diseases and accidents, particularly paralysis and burns. The principal malformations met with here are, deficiency or redundancy of parts, a webbed condition of the fingers, and organic contraction of the muscles and palmar aponeurosis, constituting a species of distortion analogous to club-foot.

WOUNDS OF THE HANDS AND FINGERS.

Wounds of the hands and fingers present themselves in a great variety of forms, as incised, lacerated, contused, punctured, and gunshot, and require essentially the same kind of treatment as similar lesions in other regions of the body. After the removal of foreign matter, their edges should be carefully approximated by suture and adhesive strips, when the parts should be supported upon a well-padded splint, extending from the inferior third of the forearm to the ends of the fingers, so as to place the wrist and phalangeal joints in the most easy and quiet position. If the fingers are fractured, the affected members may be placed in a hollow pasteboard splint. Unless the bones are comminuted and the soft structures extensively lacerated, it would be improper, as a general rule, to amputate. Most cases will do well under simple treatment. Even when a joint is pretty fully laid open, provided the articular cartilage has not sustained any serious injury, an attempt should always be made to save the parts. The same principles are strictly applicable to wounds of the carpus and metacarpus, involving the bones. Extraordinary recoveries often occur, especially in young, healthy subjects, in injuries of these parts under circumstances apparently of the most adverse character.

Wounds of the hand occasionally bleed very profusely, in consequence of involvement of the palmar arch, and, as the affected vessels are generally deeply seated, the hemorrhage is often checked with difficulty. The best plan usually is to apply the ligature, but in order to do this it is frequently necessary to enlarge the wound very freely as a preliminary step, and even then the surgeon may be thwarted in his efforts. When this is the case, direct pressure may be tried, or a piece of cork may be applied to the radial and ulnar arteries at the wrist; if these expedients fail, the only chance of safety will be ligation of the brachial.

Sometimes a portion of a finger is torn off along with one of its tendons and perhaps also a portion of the fleshy belly of the corresponding muscle. If the two last bones are seriously involved, it will be best to amputate at the metacarpo-phalangeal articulation, otherwise an attempt should be made to save the finger, although it should turn out, as it will be likely to do, to be permanently stiff.

The best application in most cases of wounds of the hands and fingers is cold water, with the addition, if there is much contusion or laceration, of a little alcohol and laudanum. Care should be taken not to disturb the dressings too often, as such a procedure generally materially impedes the reparative process.

In cleaning a fresh wound of the hand and fingers, the patient often experiences excessive pain from the use of cold water, especially if he is of a nervous, irritable temperament. For this reason, the fluid should always be tepid, and it may even be proper, under such circumstances, to dispense with cold water-dressing altogether for several hours after the receipt of the injury.

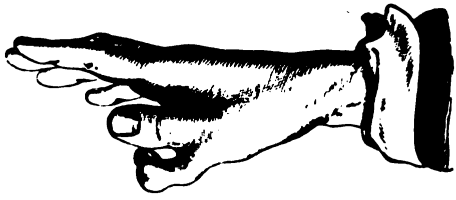
CONGENITAL IRREGULARITIES OF THE FINGERS.

A *deficiency* in the number and size of the fingers is occasionally observed, one or two being entirely wanting, or they may be so stunted as to give the hand a very singular, unseemly appearance. In a case recently at my clinic, the fingers were all very short and stumpy, each being deficient in a phalanx. They were connected together by thick webs, smooth on the palmar surface, but rough and grooved on the dorsal, and were provided each with an excellent, well-shaped nail. The thumb was small, but natural, and had no membranous attachment to the index finger. The person, who was a member of the profession, enjoyed a very good use of the limb.

In some cases, there are only two fingers with a thumb; and not long ago I saw an instance where there was but one. The members, under such circumstances, may be of the natural shape and size, or they may be variously changed in their appearance, being generally thick and clumsy, or more or less contracted and stumpy. Occasionally they have a bulbous, knotty look, as if the umbilical cord had been twisted round them, and thus interrupted their natural growth. The thumb, I believe, is rarely affected in these mishaps.

A *supernumerary* finger is uncommon, while it is by no means rare to see an additional thumb, as in fig. 695. Such a freak is occasionally met with on both sides, and there are some curious cases on record where each hand had a supernumerary thumb, and each foot a supernumerary toe, the individuals being, in other respects, perfectly well formed. Some of these cases have heen hereditary. When an additional finger exists, it usually occurs in connection with the little finger.

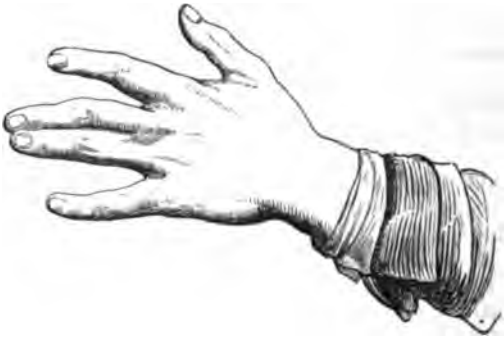
Fig. 695.



Supernumerary thumb.

The supernumerary member is generally a good deal smaller than the normal one, but well-shaped, and furnished with an excellent nail. Occasionally it is bulbous, knobby, curved, and quite unseemly. Its attachment may be purely cutaneous, but in most cases it will be found to be through the medium of a separate joint, having a distinct synovial membrane.

Fig. 696.



Webbed fingers.

A deficiency of fingers is, of course, an irremediable affection. If the person belongs to the higher ranks of society, something may be done to supply it by the adaptation of artificial substitutes, secured to a glove, which, when worn, as it readily may be in company, shall hide the defect.

Any supernumerary piece that may exist is readily taken away by a very simple operation, care being taken to leave a sufficiency of integument to cover the wound, and to remove the part close to its attachment. I have seen two cases where, a portion of the proximal phalanx being left, an unseemly projection remained, not at all creditable to the skill of the surgeon. The operation may be done within a few weeks after birth; if neglected until the person attains the age of manhood, he will be very apt to grow indifferent about it.

A *webbed* condition of the fingers, fig. 696, is easily remedied by passing a bistoury vertically from below upwards, through the redundant fold, and, after having removed what is superfluous, tacking the edges of the wound together by several points of the interrupted suture, or allowing it to heal by the granulating process. The fingers are afterwards supported upon a carved splint, lint, spread with simple cerate, being interposed between them, to prevent readhesion.

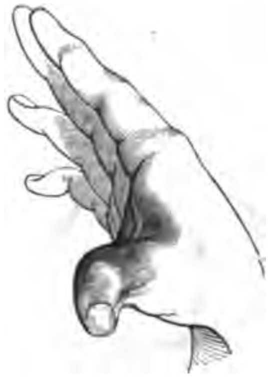
HYPERTROPHY OF THE FINGERS.

Hypertrophy of the fingers, although uncommon, is now and then observed; generally as a congenital vice, but sometimes as an acquired one. It usually affects several fingers, either simultaneously or successively, the others remaining sound. All the component structures, hard as well as soft, are equally involved, and the result is that there is often great and inconvenient deformity, the parts being heavy, cumbersome, and perhaps nearly twice as thick and long as in the natural state. The affection, of the true nature of which we are ignorant, is occasionally hereditary, and it has also been observed in several members of the same family. The treatment consists of systematic compression and sorbefacient applications, as the tincture of iodine, and the ointment of iodide of lead. If these means fail, as they generally will, and the enlarged member is not only useless, but unseemly and inconvenient, the only resource is amputation.

CONTRACTION OF THE HAND AND FINGERS.

Permanent contraction of the thumb and fingers from rheumatism, burns, paralysis, and other causes, is not uncommon, and is liable to be attended with the most distressing deformity and inconvenience. Such a condition is sometimes the result of a congenital vice, as in fig. 697, from one of my clinical cases. The distortion may exist in various degrees, and may be occasioned simply by a contraction of the tendons, of the palmar aponeurosis, or of a diseased cicatrice, or all these structures may be involved simultaneously, as is, perhaps, in fact, most generally the case. The inodular tissue left by burns and scalds has an astonishing contractile tendency, which often resists the most ingenious efforts of the surgeon to overcome it, and which, in time, is capable of producing the most horrible deformity, the fingers being bent like claws, deeply imbedded in the substance of the hand, or firmly united to one another. In paralysis, the fingers are frequently permanently flexed, in consequence of the shortened condition of the tendons of the flexor muscles, while the extensors are elongated, and completely deprived of their functions.

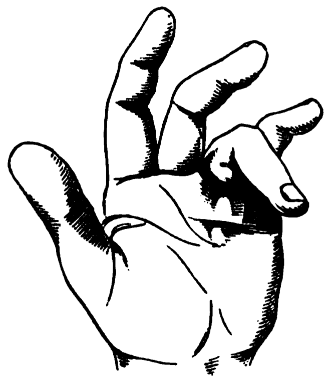
Fig. 697.



Contraction of the thumb.

The immediate cause of these contractions, or the nature of the structures on which they directly depend, can be determined only by a careful examination, and the result must, of course, govern the treatment. The shortening occasioned by rheumatism, if existing in a high degree, will hardly be amenable to any remediable measures, however judiciously employed; it is only in the milder and more recent cases that much benefit need be looked for. The use of colchicum, assisted by calomel and opium, and the application of iodine and anodyne liniments, are the means chiefly to be relied upon. When the disease has been deprived of its acuity, an attempt may be made to break up the adhesions within the joints, and to restore the contracted muscles to their proper length, by gentle flexions and extension, or passive motion, the cold douche, and sorbefacient lotions, together with the splint and bandage, to maintain the hand constantly in a straight position.

Fig. 698.



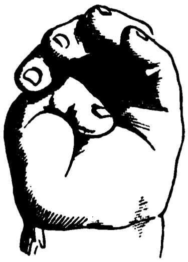
Contraction of the ring finger.

When the deformity is occasioned by permanent shortening of the muscles, or tendons, as in fig. 698, however induced, tenotomy is of questionable propriety, experience showing that, although the operation may relieve the distortion, the patient never regains any material use of the affected part; on the contrary, indeed, he is generally made worse by it. Hence the judicious surgeon should long hesitate before he undertakes a procedure likely to be followed by such a result. In particular should this be the case when all, or nearly all, the fingers are involved; for it has happened under such circumstances that what little use of the hand the poor patient still possessed, was entirely destroyed by the division of the tendons, their ends refusing to unite. When one finger only is concerned, and the object is to relieve an ugly and inconvenient deformity, no objection whatever can be urged against the operation.

It will thus be seen that there is a remarkable difference between tenotomy of the hand and fingers and tenotomy of the feet. In the latter, the ends of the divided tendons always unite with great promptness, so that the patient, if the case be well managed, is sure, in time, to acquire a good use of his extremity; in the hand, fingers, and forearm, on the contrary, there is rarely, if ever, any perfect reunion, and the consequence is that the operation, so far as the functions of the limb are concerned, is a complete failure. The cause of this difference seems to be the existence of a larger amount of synovial fluid in the sheaths of the tendons of the superior extremity than in those of the inferior, and the greater amount of space which intervenes between these structures, when divided, in the former than in the latter of these situations.

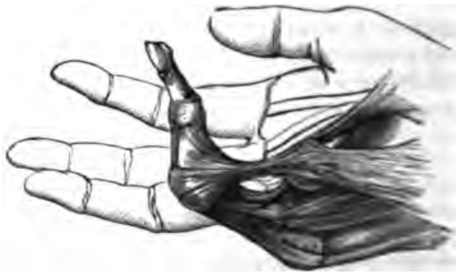
When the deformity is dependent upon the contraction of the *palmar aponeurosis*, as in fig. 699, it may, in general, be readily rectified by the free division of the resisting parts by a subcutaneous operation with a delicate, sharp-pointed tenotome. These parts are well displayed in fig. 700. The aponeurosis may, if necessary, be cut completely across where it covers in the palm, and any of its digital slips that may seem to be at fault may then be successively traced out and severed. The after-treatment demands great attention. The hand and fingers must be enveloped in a bandage, and then carefully bound upon a well padded carved splint, frequent washing, friction, and passive motion not being neglected.

Fig. 699.



Contraction of the fingers.

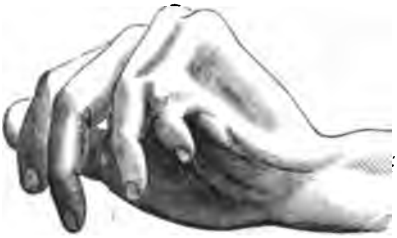
Fig. 700.



Contraction of the palmar aponeurosis.

Deformity of the hand and fingers arising from the *vicious cicatrices* of burns and scalds, as in fig. 701, seldom admits of satisfactory relief. When the inodular tissue presents itself in the form of narrow bridles, it may be completely exsected, and the wound approximated by suture; or the bands may be cut across at different points, and the gaps healed by granulation, the limb being maintained in the extended posture during the cicatrizing process, as well as for some time after, in order to prevent a recurrence of the contraction. When the cicatrice involves a large surface, nothing short of its entire removal, and the transplantation of a flap of healthy integument, will be likely to answer any useful purpose. The graft might be borrowed from the other arm, or from the chest, as might seem most feasible.

Fig. 701.



Vicious cicatrices of the fingers.

CONCUSSION AND CONTUSION OF THE FINGERS.

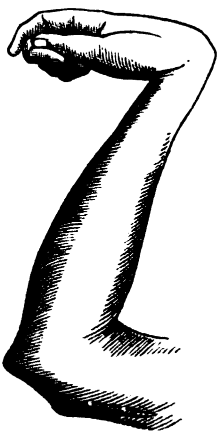
These affections, of which I have witnessed numerous cases, are generally the result of falls, in which the finger is doubled under the hand, or struck against some hard body, as the floor or pavement. Sometimes the effects of concussion predominate, at other times those of contusion; and there are cases in which both are conjoined with sprain, caused by the sudden and forcible extension of the ligaments of some of the articulations. However this may be, the affected finger feels not only painful but benumbed and heavy; occasionally an unpleasant tingling is experienced. Considerable swelling often ensues, and for days, if not weeks and months, the patient is unable to use the affected member. In some instances the suffering is confined to one particular spot, perhaps not more than two or three lines in diameter; at other times the chief trouble is in one of the joints, manifesting itself, in either case, simply in a little soreness or tenderness, with some degree of numbness. The affection is most liable to prove obstinate and troublesome, if, at the time of the accident, there is impairment of the general health, or a dyspeptic condition of the system, with disorder of the secretions. Under such circumstances, indeed, the secondary effects are often much more annoying than the primary. In some instances, the whole finger, and even a portion of the hand, become permanently cold, enfeebled, and wasted.

The *treatment* is at first strictly antiphlogistic, the principal remedies being leeches, saturnine lotions, and tincture of iodine. When the case is chronic, the hot and cold douches will be serviceable, conjoined, when the general health is deranged, with a mild alterant and tonic course, exercise in the open air, and a properly regulated diet. Vesication is seldom of much benefit. When the pain or tenderness depends upon deep-seated inflammation, recourse may, with advantage, be had to subcutaneous scarification of the periosteum.

CLUB-HAND.

The hand is sometimes distorted in such a manner as to present an appearance analogous to club-foot, especially the variety called varus. Hence it is generally termed club-hand, an appearance well seen in fig. 702. The affection is occasionally congenital, but in the great majority of cases it supervenes in consequence of paralysis, or of a loss of antagonism in the two classes of muscles. The alterations are characteristic. The hand is inverted, the internal margin inclining strongly upwards, the fingers are more or less flexed, and the carpus seems to be partially dislocated from the radius and ulna, forming a marked projection at the inner border of the limb. Sometimes the hand is turned in the opposite direction, in imitation, as it were, of valgus, or the everted variety of club-foot. However this may be, the affection is not unfrequently associated with distortion of other parts of the body, and usually occurs in persons of a debilitated frame, or in such as are particularly prone to suffer from nervous diseases. Very recently, I saw a case in which both hands and both feet were clubbed, the patient being a child three months old.

Fig. 702.



Club-hand.

The *treatment* consists in the removal of the exciting cause, and the improvement of the general health. To accomplish the latter, a course of chalybeate tonics, exercise in the open air, and the daily use of the cold shower-bath, will be the best means. Electric currents may occasionally be passed through the affected limb, and the surface may be frequently rubbed with some stimulating lotion. If the case be recent, and the deformity comparatively slight, forced extension, repeated several times a day, and long-continued, will sometimes effect a cure. When this fails, an attempt may be made at rectification by the employment of appropriate apparatus, similar to what is used in the milder forms of club-foot; but, under opposite circumstances, division of the affected tendons alone will enable us to relieve the distortion, although a long time will elapse before there will be much improvement of the functions of the parts. The muscles whose section will generally be necessary are the long palmar, the flexors of the radius and ulna, and the superficial flexor of the fingers, the knife being introduced with the greatest caution, lest injury be inflicted upon the arteries and nerves of the forearm.

REMOVAL OF RINGS FROM THE FINGERS.

Serious difficulty is sometimes encountered in removing rings from the fingers, either in consequence of tumefaction caused by their pressure, or of the increased size of the member, as when the ring, put on early in life, has not been taken off for a long time. Most generally, however, it arises from a small ring being forced upon a disproportionately large finger. If relief be not promptly afforded, severe inflammation will ensue, terminating in ulceration and perhaps in gangrene. Several methods may be adopted for effecting this object. In the first place, the hand may be immersed in ice-water, to cause contraction of the finger; or the finger may be tightly bandaged, and then held in ice-water. If these expedients fail, a piece of pack thread, or saddler's silk, well waxed, should be closely and firmly wrapped round the finger, beginning at the distal extremity, and extending as high up as the ring. The thread is then passed by means of a small blunt bodkin under the ring, when, drawing it very tightly, the ring is gradually forced down as the ligature is untwisted. Should this plan also prove fruitless, the only other resource is to cut the ring in two with a file, or a delicate pair of bone-nippers.

WHITLOW.

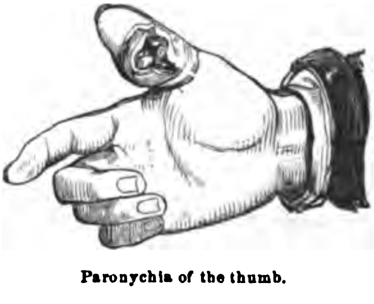
This disease, technically called paronychia, and vulgarly felon, is an affection of the thumb or finger, commencing in inflammation, which soon terminates in suppuration, and sometimes even in gangrene. It is distinguished by the great severity of its pain, and exhibits itself under two varieties of form, the superficial and the deep, the former being limited to the skin and cellular substance, whereas the latter involves not only these structures, but also the tendon, periosteum, and bone.

Whitlow is very rare in children, and I do not remember ever to have met with it in infants. It is most common between the ages of twenty and thirty-five, but is also sufficiently frequent in elderly persons, cases occasionally occurring after the eightieth year. Females are more subject to it than men, and the probability is that certain occupations predispose to its development. Thus, washerwomen, and other persons who have their hands habitually immersed in water, are particularly obnoxious to it. At times, the disease is epidemic, as happened a few years ago in various sections of the Union, when an unusual number of cases, in both sexes, and of different ages, fell under my observation and treatment. An affection similar to whitlow is occasionally met with in the toes.

In the superficial forms of whitlow, the inflammation is generally seated immediately around and beneath the nail, commencing either at the side of the finger, upon its dorsal surface, or at its extremity. Without much, if any, swelling, the part is of a dusky reddish aspect, tender on pressure, and exquisitely painful, throbbing violently and incessantly, and causing more or less constitutional disorder. In from two to three days after these phenomena present themselves, matter is observed in the finger, lying just beneath the epidermis, which is elevated into yellowish vesicles at the side and back of the nail; in many cases, pus is also situated below the nail, especially at its posterior extremity; and sometimes, again, it is found chiefly, if not exclusively, in the cellular substance immediately beneath the true skin. The inflammation generally extends some distance up the finger, and occasionally even over a considerable portion of the hand, which may be a good deal swollen, stiff, and painful. Not unfrequently, a reddish line, indicating the course of an absorbent vessel, is seen running along the limb, as high up, perhaps, as the axilla.

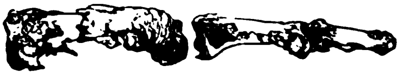
In the deep-seated variety of whitlow, the inflammation involves all, or nearly all, the structures of the finger, and is frequently followed by the destruction of one or more of the phalanges. The pain is of extraordinary severity, depriving the patient of sleep for days and nights together; throbbing, tensive, and diffused, often extending as high up as the elbow and even to the shoulder; steady and persistent, but greatly aggravated by depending position, and only subsiding with evacuation of the inflammatory deposits, or the death of the part. The swelling also is great, sometimes enormous, involving both finger, hand, and wrist; the skin is red and œdematous, having a puffy, erysipelatous aspect; and the whole limb is often stiff and useless. If the morbid action is not speedily checked, matter will form deep among the tissues, in the connecting cellular substance, within the sheaths of the tendons, and beneath the periosteum, and spreading in different directions, will cause extensive havoc, burrowing along the finger and hand as far up, perhaps, as the wrist and forearm. In neglected cases, gangrene occurs, followed by sloughing of the tendons, and exfoliation of the phalanges. The external characters of whitlow are well illustrated in fig. 703, while the effects which the disease often exerts upon the bones are displayed in fig. 704.

Fig. 703.



Paronychia of the thumb.

Fig. 704.



Necrosis of the bones in whitlow.

Whitlow, in its more severe forms, is always attended with well-marked constitutional disturbance. The patient, tortured with pain, is feverish, and unable to sleep; his appetite is lost; his head, back, and limbs ache; the face is flushed, and the pulse is strong, hard, and frequent. In some cases delirium is present.

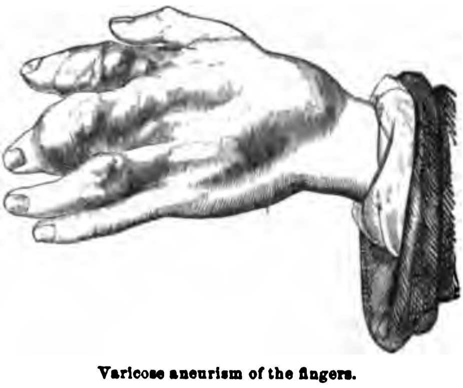
How this disease is produced, or what its real character is, is still a mooted question. The most plausible conjecture is that it is a bad form of inflammation, not unlike carbuncle, occurring in a constitution more or less depraved, in consequence of a disordered state of some of the secretions, particularly those of the digestive apparatus. In the female, it is occasionally associated with irregularity of the menses, but whether as an effect or coincidence, we are unable to determine. My belief is that it is quite impossible for whitlow to occur in a constitution that is entirely sound. I should, therefore, infer that it it a peculiar form of inflammation, self-limited in respect to its tendency to terminate in suppuration.

There is no disease with which paronychia is likely to be confounded. Its peculiar situation, the severity of the pain, the dusky appearance of the skin, and the speedy occurrence of suppuration, will always enable the practitioner to distinguish it readily from other affections. Boils and carbuncles never occur upon the extremity of the fingers.

In the *treatment* of this affection very little is to be expected from the employment of abortive measures, since, as has already been stated, its tendency is always to pass into suppuration. In its milder forms, and earlier stages, the morbid action may be limited occasionally by a brisk cathartic, and the application of the undiluted tincture of iodine, made two or three times in the twenty-four hours, with an emollient poultice, wet with laudanum, in the intervals; but, in general, the disease will go on, in spite of all that we can do, to the formation of matter. When the swelling is very considerable, leeches may sometimes be used advantageously in the vicinity of the focus of the inflammation, and in such instances I have also occasionally experienced great benefit from the application of a pretty large blister. To relieve the excessive pain, opiates must be given in full doses, and it will be well, also, for the patient to take, every three or four hours, a dose of the antimonial and saline mixture. It need hardly be added that the hand should be kept perfectly quiet, in an elevated position.

The above means are, however, at best, only palliative, relieving pain, and, perhaps, limiting morbid action, but not eradicating it; "scotching but not killing the disease." The great and indispensable remedy, after all, is the knife, employed early and boldly, not expectantly and timidly; the incision being long and deep, the edge of the instrument grating upon the bone. Suppuration is, if possible, anticipated, and structure thus saved. When the matter has been permitted to burrow, numerous openings may be necessary, and extensive mischief may take place, before we may be able to reach the point of repair, the fingers, hand, and wrist long remaining stiff, painful, and unserviceable. Dead bone is removed as soon as it is easily separable, the periosteum being as little interfered with as possible, and amputation always avoided, experience having shown that a new phalanx is sometimes formed, and that, even when this does not happen, the boneless finger will be both useful and sufficiently seemly. When the violence of the inflammation has subsided, the parts should be kept constantly wet with some anodyne and astringent lotion, alcohol and laudanum, or a solution of opium and hydrochlorate of ammonia. At a still later period, they should be well douched, first with warm, and then with cold water, dried, and rubbed with soap liniment, or camphorated mercurial ointment, and supported with a bandage, each finger being enveloped separately. These directions may seem trivial, but any one who has ever had whitlow in his own person, or who has seen much of the disease in others, will not fail to appreciate their value.

Fig. 705.



Varicose aneurism of the fingers.

VARICOSE ANEURISM OF THE FINGERS.

The fingers are liable to varicose aneurism, consisting, as the term implies, in an enlargement of the arteries and veins, superficial as well as deep; usually commencing before birth, and progressively augmenting until, as seen in fig. 706, it occasions great deformity and inconvenience. In some instances, the disease extends over the hand, the forearm, and even the arm, as high up as the axilla.

The fingers are of a purple color, of a soft, spongy consistence, nodulated, and several times the natural bulk. They pulsate synchronously with the heart, and are readily diminished by pressure, but immediately regain their former size when the pressure is discontinued. Dissection shows the vessels to be not only enlarged, but also tortuous, thickened, and indurated, with a predominance, at one time, of the arterial, and, at another, of the venous element. The disease is rarely attended with pain.

The *treatment* of this affection is unsatisfactory, as it has hitherto proved refractory under every variety of local measures. So long, therefore, as it causes no serious inconvenience, or evinces no disposition to increase, no attempt should be made to molest it. A spontaneous cure is, of course, never looked for. When the enlargement is limited to several arterial trunks, ligation may be employed, the varicose veins being afterwards treated by injections with the persulphate of iron. If the deformity is very great, nothing short of amputation will suffice.

PHLEGMONOUS INFLAMMATION AND ABSCESS OF THE HAND.

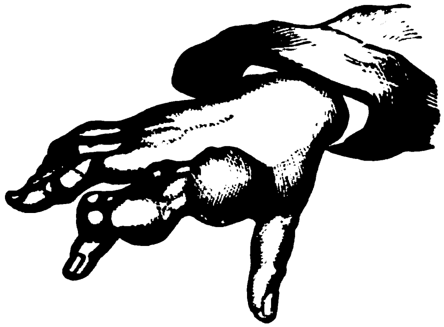
A very distressing form of inflammation, closely resembling whitlow, occasionally occurs in the hand, generally in the palm, in consequence of external violence, as a puncture or contusion. It is deep-seated, commencing either in the palmar aponeurosis, in the sub-aponeurotic areolar tissue, or in the sheaths of the tendons. However this may be, all these, as well as the other structures, both hard and soft, rapidly become involved in the morbid action, which often spreads over a large extent of surface. The symptoms are those of violent inflammation; the parts are excessively swollen, of a dark red or livid color, and the seat of exquisite pain, of a throbbing, pulsatile character. The fingers and wrist are stiff and tumid, and there is always high constitutional excitement, not unfrequently attended with intense headache and even delirium, especially when matter is about to form.

The *treatment* of this disease must be prompt and energetic. Blood must be taken freely from the part by leeches, or even from the arm, if the patient is at all plethoric; the bowels must be thoroughly evacuated, and vascular excitement must be subdued with depressants. The hand, elevated, and kept at rest, is surrounded with cloths wet with a strong solution of acetate of lead and laudanum, and no time is lost in letting out pus. If this be neglected, the worst consequences are to be apprehended, as necrosis of the bones, anchylosis of the joints of the fingers, and permanent contraction of the tendons. Occasionally mortification occurs.

TUMORS OF THE HAND AND FINGERS.

The thumb and fingers are occasionally the seat of various kinds of tumors, benign and malignant, interfering with their comfort and usefulness, and requiring removal. Both classes of affections are, however, very uncommon as primary developments. I was obliged, not long ago, to amputate the thumb of an elderly lady for a melanotic disease of twelve years' standing, and I have removed several fingers on account of epithelioma; but, of genuine primary scirrhus and encephaloid of the thumb and fingers, no example has ever fallen under my notice.

Fig. 706.



Enchondroma of the index-finger.

Among the benign tumors of the thumb and fingers, the most common is the *enchondromatous*, fig. 706, beginning early in life, in children of a stunted, rickety formation, and soon attaining so great a bulk as to interfere materially with the usefulness of the part. The growth, which is hard, tense, and incompressible, and which takes its rise in the osseous tissues, is often multiple, several masses affecting the same finger, or even the same bone. Now and then, nearly every finger suffers. Its volume varies from that of a pea to that of an orange. The formation is generally unattended with pain, the only inconvenience which it occasions being caused by its weight and size. If permitted to go on unrestrained, or if imperfectly removed, it may assume malignancy, but such an event is uncommon.

The diagnosis of the enchondromatous tumor is very easy, the history of the case, the absence of pain, and the peculiar form, density, and situation of the tumor, always sufficiently declaring its character.

The only remedy is ablation, not of the tumor, but of the finger upon which it is situated. If the mass merely be excised, speedy recurrence will be inevitable, with a tendency, in all likelihood, to malignancy in consequence of rapid cell formation, the part being softer than originally, and growing with unusual vigor. When the tumor involves the hand, a portion of it also must be sacrificed.

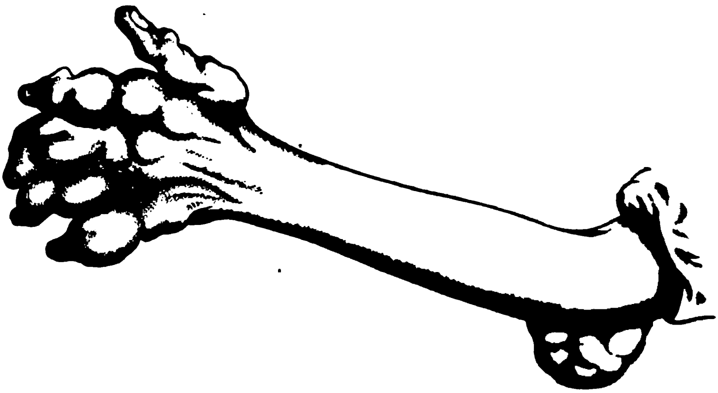
The *fatty tumor* of the hand is extremely rare. I have myself seen no example of it. Mons. Follin has related the history of a case of fatty tumor of the middle finger of a man fifty years old. It was as large as a pullet's egg, and adhered firmly to the sheath of the tendon, which was opened in removing it.

A *fibrous tumor*, hard, firm, dense, and inelastic, is occasionally met with in the hands and fingers. It ranges in size from a small pea to that of a hazelnut, is perfectly movable and free from pain, and is situated immediately beneath the skin, to which it is generally more or less closely adherent. The number of tumors is sometimes considerable, as many as twenty having been noticed in the same person. Occasionally they are perfectly symmetrical, occupying similar positions both upon the hands and fingers. The cause of these growths is unknown. In some of the cases that have fallen under my observation, they appeared to be dependent upon a syphilitic taint of the system.

The *treatment* of this form of tumor must depend upon circumstances. When its origin is clearly traceable to the effects of syphilis, the most suitable remedy will, of course, be iodide of potassium, in union with mercury. Excision can only be proper when the growth acts obstructingly.

Terrible suffering and deformity of the thumb and fingers, with great impairment, if not total loss, of function, occasionally arise from *gouty deposits* in the phalangeal joints. The affection, of which the annexed sketch, fig. 707, from Garrod, affords a good illustration, usually coincides with similar formations in other parts of the body, especially the elbow, knees, toes, and heel, and is evidently dependent upon the retention of the lithate of soda, the morbific material of gout, the kidneys being unable to eliminate it with sufficient rapidity. The fingers, at first merely stiff and painful, present a tuberoid appearance, looking

Fig. 707.



Gouty deposits in the joints of the fingers and bursæ of the elbow.

as Sydenham expresses it, like a bunch of parsnips, and becoming ultimately completely immovable and useless. The substance upon which the deformity depends is originally of a soft, creamy consistence, and of a whitish, grayish, or dark color; but, by degrees, it assumes the solidity of chalk or mortar, so that, if several pieces coexist, the diseased joints sometimes rattle like bags of marble. As the swelling augments, the concretions approach the surface, causing attenuation, and finally ulceration, of the skin, with a partial discharge of the characteristic material.

The *treatment* consists in rectifying, by appropriate diet, purgatives, colchicum, and alkalies, the peculiar state of the system upon which the formation of the lithic acid depends, and in removing, if necessary, by puncture and pressure, the inspissated matter from the affected joints. Amputation must not be thought of, unless the pain and deformity are excessive, and cannot be relieved in any other way.

2. AFFECTIONS OF THE ELBOW.

The large *synovial burse* which is interposed between the tendon of the triceps muscle and the top of the olecranon, and which in some instances is multilocular, is liable to inflammation and great distension from the accumulation of its natural secretion, forming thus a swelling, occasionally of extraordinary size, at the posterior and lateral aspect of the elbow. The parts are tender on pressure, and impart a peculiar crepitating, fluctuating sensation, which readily distinguishes it from other affections in this situation. The usual cause of the disease is external violence, though it sometimes arises spontaneously. Persons, as miners, for example, who lean habitually upon the elbow, are very subject to the disease. The morbid action may become chronic, or even pass into suppuration; and in cases of long standing the coats of the synovial bag are occasionally very much thickened and indurated. Now and then such a tumor contains loose fibroid bodies, resembling small melon seeds in appearance.

The *treatment* consists in the application of leeches, blisters, and sorbefacient lotions, with rest of the parts, and an occasional purgative. If the accumulation of fluid is unusually great, an incision may be made, and the surface of the pouch mopped with dilute tincture of iodine. Matter should always be promptly evacuated.

Anchylosis of the elbow is a frequent consequence of caries, dislocations and fractures, and may present itself in various degrees, from the slightest stiffness to complete osseous immobility. The forearm is generally bent nearly at a right angle, but occasionally it is in the straight position, thus rendering it, in great measure, if not completely, useless for the ordinary purposes of life.

The *treatment* must depend upon the nature of the adhesions, as to whether they are fibrous or osseous. In the milder cases, the proper remedy is the laceration of the morbid connections by forcible flexion and extension with the aid of chloroform, regular passive motion being afterwards maintained to prevent relapse. Osseous union, if not too strong, may be broken up with the perforator, introduced subcutaneously; or, if the operation fail, or is contra-indicated, resection may be employed, a V-shaped portion of bone being cut out from the back part of the elbow, with a view of establishing a false joint.

Sometimes the anchylosis depends mainly upon osseous adhesions of the olecranon, the rest of the articulation partially retaining its integrity. In two instances of this kind I succeeded in effecting excellent cures by forcibly breaking this process; an operation which is usually not difficult in recent cases, as the osseous tissues are then always more or less softened.

The elbow-joint is sometimes rendered useless by the contraction of the brachial aponeurosis and the tendon of the two-headed flexor muscle, in consequence of paralysis, rheumatism, or burns. The proper remedy consists in the division of the affected parts, the operation being performed in such a manner as not to interfere with the brachial artery, and extension being afterwards made with an angular splint, united by hinges, and worked by a screw. In this manner, the limb may often be restored to usefulness in a very short time, especially when there is no serious disease of the joint.

3. AFFECTIONS OF THE SHOULDER.

Wounds of the shoulder, of whatever character, must be managed upon the same general principles as similar injuries in other parts of the body. Several remarkable instances have been recorded in which the arm and scapula were suddenly torn off from the trunk, and yet the hemorrhage was so slight as not to require the ligature. The cases of Cheselden and La Motte have become classical. Frightful and extensive as were the wounds, the patients rapidly recovered without an untoward symptom. Although there is generally no copious bleeding in lacerated wounds, the possibility of such an event, upon the occurrence of reaction, should always dictate the propriety of securing the principal arteries.

Paralysis of the muscles of the shoulder, but more particularly of the deltoid, the result generally of external injury, as a blow or fall upon the part, is sometimes met with, and often proves exceedingly obstinate, if not irremediable. Although the affection is ordinarily occasioned by direct injury, cases occur in which it is produced indirectly, through force applied to the elbow or hand. A considerable number of cases have fallen under my observation in which the attack was apparently due to the effects of cold.

The immediate cause of the paralysis appears to be the contusion, compression, or laceration, or these different lesions combined, of the nerves of the affected muscles, and, doubtless, also of the fibres of the muscles themselves. However this may be, the muscles, whose natural stimulus is thus cut off, soon fall into a state of atrophy, becoming thin and flabby, and partially, if not completely, powerless. By degrees, the morbid influence extends to the shoulder-joint, causing inflammation of the synovial membrane, followed by morbid adhesions between the contiguous surfaces, and eventually, in many instances, by complete anchylosis. The sensibility of the part is often, though not always necessarily, much impaired, and the patient usually experiences fixed or darting pains, resembling those of rheumatism. The paralysis may be limited to the deltoid, or it may affect, either simultaneously or successively, the other muscles of the shoulder, as well as some of those of the arm and forearm, followed by a cold and withered condition of the entire limb. The general health is usually somewhat impaired; occasionally very much.

The prognosis is variable. In the milder cases, the parts, under judicious management, usually recover in from three to eight weeks, whereas, in the more severe ones, very little benefit is to be expected from therapeutic measures of any kind.

The *treatment* of paralysis of the muscles of the shoulder must, in the first instance, be conducted upon strictly antiphlogistic principles; by rest, leeches, and soothing applications, as weak solutions of lead and opium, spirituous lotions, or arnica and laudanum, with a view of subduing the inflammation which must necessarily follow whenever the disease is of traumatic origin. Subsequently our main reliance must be upon the hot and cold douches, frictions, stimulating liniments, passive motion of the shoulder-joint, shampooing of the muscles, and electricity. The general health must not be neglected. In most cases, the patient will be greatly benefited by a course of tonics, alterants, change of air, and sea-bathing. In obstinate cases I have sometimes derived marked relief from the repeated application of a blister.

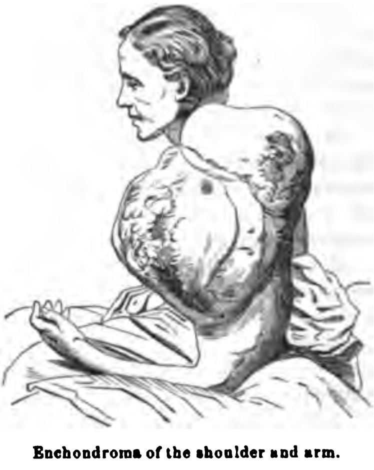
Anchylosis of the shoulder-joint may be caused by injury, or by want of use in consequence of paralysis of its muscles, eventuating in effusion of plastic matter. Such cases generally admit of cure, simply by breaking up the morbid adhesions under chloroform, and then instituting a regular system of passive motion, aided by the use of the douche, sorbefacient liniments, and dry friction. When the anchylosis is osseous and not too extensive or old, an effort may be made to destroy the connections with the perforator employed subcutaneously; or, this failing, resection may be performed.

Injury and rheumatism of the shoulder-joint are sometimes followed by contraction of the soft parts in its vicinity, seriously interfering with the restoration of its functions. Passive motion will do much for such cases, and the knife can only be required when there is marked shortening of the pectoral muscle, pinioning the arm to the side. In making the section of the muscle, regard must be had to the safety of the axillary vessels and nerves.

In consequence of burns and scalds giving rise to *vicious cicatrices*, the arm is sometimes fastened to the side of the chest, thus restricting the movements of the shoulder-joint, and rendering the limb in great degree useless. Unless the attachments are very broad and extensive, a very simple operation, consisting in the division of the fibrous or cutaneous bands, will generally suffice to afford relief, especially if care be taken during the healing process to keep the arm away from the trunk. Occasionally it will be found necessary to aid the cure by the division of some of the fibres of the pectoral muscle.

Various kinds of *tumors*, benign and malignant, solid and fluid, are liable to form upon or around the shoulder, commencing either in the soft structures, in the joint, or in the bones, especially the scapula and humerus. Of the benign growths liable to appear here the most common are the fatty, fibroid, and enchondromatous, all of which are capable of attaining a great bulk; they are distinguished chiefly by the tardiness of their development, and by the fact that they generally occasion no other inconvenience than what results from their weight and size. Erectile tumors are always easily recognized by their history, color, and consistence. They are situated either in the skin, or skin and cellular tissue, and are, for the most part, of a purely venous structure, though sometimes they are decidedly aneurismal.

Fig. 708.



Enchondroma of the shoulder and arm.

The annexed sketch, fig. 708, represents an enormous enchondroma of the left shoulder of an elderly woman, of Corinth, Mississippi. It was twenty-seven inches in length, and was estimated to weigh upwards of fifty pounds. The drawing was kindly sent to me by Dr. R. H. Brown, of the army. The growth had begun six years previously in consequence of a severe blow.

In a case of cartilaginous tumor under my observation last winter, in a man twenty-six years old, the mass occupied the right shoulder, and involved the whole scapula and nearly the upper half of the humerus, along with the outer extremity of the clavicle. It was of very irregular shape, and of almost bony hardness, measuring forty-five inches in circumference at its base, and weighing, as was ascertained by Dr. Bigelow after death, thirty-one pounds. It had been first noticed about six years previously, as a small tumor upon the back of the scapula. The man's general health had remained excellent until within a short time of his death. The size of the tumor had more than doubled itself during the last twelve months of his life.

This tumor might, doubtless, have been removed before it had acquired its great bulk. Dr. J. B. S. Jackson, who dissected the man after death, states that it was easily separated from the walls of the chest, and that the subclavian vessels and nerves ran along its surface, but were not imbedded in it. A section of the mass, kindly sent to me by Mr. J. C. Warren, of Boston, exhibited all the characteristic features of the enchondromatous formation.

Of malignant tumors almost the only one liable to occur here is the *encephaloid*, which may take its rise either in the cellular tissue, or, as is more commonly the case, in the scapula, humerus, or clavicle. It is characterized by the rapidity of its growth, its soft, semi-elastic consistence, its deceptive sense of fluctuation, and its great bulk. Enlargement of the subcutaneous veins is generally a prominent phenomenon.

In regard to the *treatment* of these tumors no definite rules can be laid down. When situated superficially, they should be extirpated in the usual manner; if, on the contrary, they involve the osseous structure, excision, or amputation will be required, and the sooner the operation is performed the better for the patient and the surgeon.

4. AFFECTIONS OF THE AXILLA.

The axilla is liable to wounds, inflammation, abscess, tuberculosis of the lymphatic ganglions, encysted tumors, and malignant disease, especially encephaloid and scirrhus. Aneurism may also occur here, but as this disease has been described elsewhere, it is not necessary to repeat what was then said.

Wounds in this situation acquire their chief importance from their involvement of the axillary vessels and nerves. They may be of various kinds, as incised, lacerated, punctured, or gunshot, and must be treated upon the same general principles as similar injuries in other regions. Bleeding from the axillary artery must be checked with the ligature, applied both to the cardiac and distal side of the vessel, thoroughly exposed for the purpose, the wound serving as a guide to the knife. A good deal of embarrassment frequently attends the operation on account of the infiltrated and discolored condition of the areolar tissue, which, from its great laxity, admits of the ready diffusion of the blood. The subclavian artery should never be tied for such an accident.

It is not often that the division of the axillary artery is followed by gangrene of the hand, but such an occurrence will be very likely to ensue when the lesion coexists with a wound of the axillary vein, or of some of the principal nerves of the limb. In the latter event, indeed, mortification may arise without any injury whatever of the vessels.

Wounds of the axilla, from their peculiar valve-like shape, and the movements of the shoulder, are occasionally followed by *emphysema*, even when there is no injury of the lung. As such a phenomenon might cause great alarm in the mind of an ignorant surgeon, it deserves to be remembered as one of the possible contingencies of a traumatic lesion in this situation.

The cicatrization of wounds of the axilla will be materially expedited, if, after their edges have been properly drawn together, the arm be carefully fastened to the side, so as to insure perfect quietude to the parts.

Inflammation, of a common, phlegmonous, or erysipelatous character, not unfrequently makes its appearance in the axilla, and is liable to cause great suffering, besides occasionally terminating in extensive abscesses. Terrible attacks of inflammation of the lymphatic ganglions, attended with fatal results, sometimes follow the absorption of poison, such, for example, as that received in dissecting. The virus appears to be arrested in these bodies, which, in consequence, soon become swollen, tender, and exquisitely painful, the tumefaction generally rapidly spreading over the whole limb, and occasionally even over the corresponding side of the trunk.

Acute abscesses of the axilla are sufficiently common. The matter may be confined entirely to the areolar tissue, or it may at the same time be disseminated through the lymphatic ganglions. When the suppuration is at all profuse, the fluid may burrow freely among the surrounding parts, passing, perhaps, forwards beneath the pectoral muscles, backwards under the scapula, up into the neck, or even into the anterior mediastinum, although such an event must necessarily be very uncommon, and should always be guarded against by a timely outlet for the pent-up fluid. In performing the operation, the surgeon must not lose sight of the close proximity of the axillary vessels, otherwise he might produce a frightful, if not fatal, hemorrhage. The most prudent plan will be, unless the matter is very superficial, first to incise the skin, and then to divide the tissues, layer after layer, with the knife, guided by the grooved director

Chronic abscesses of the axilla are by no means uncommon, especially in young, strumous subjects, the matter, which is often very abundant, evidently forming in connection with diseased lymphatic ganglions. The progress of the swelling is generally very slow, and the phenomena of ordinary inflammation are frequently entirely absent, although occasionally the skin over the affected ganglions is abnormally hot, red, tender, and painful. The pus is always characteristic. The treatment must be by free incision, followed by sorbefacient applications, and by a course of alteratives, or alteratives and tonics.

Tuberculosis of the lymphatic ganglions of the axilla is sometimes met with, generally as a chronic enlargement, these bodies being aggregated together in such a manner as to form a hard, circumscribed, nodulated mass, easily distinguishable by its history, its consistence, the absence of pain, and its gradual tendency to suppuration. It is most commonly found in young subjects, in association with tuberculosis of other parts of the body, particularly of the lymphatic ganglions of the neck and supra-clavicular region. The disease is tardy in its progress, but the resulting tumor may, in time, acquire a very large bulk. The general health, at first unimpaired, ultimately suffers, and the patient may finally fall into a state of marasmus, although, in most cases, he will be likely to make a good recovery. The most common cause of the disease is cold acting upon a debilitated constitution. Occasionally it is dependent upon caries of the ribs or disorder of the mammary gland.

The *treatment* must be conducted upon general anti-strumous principles, iodine and bichloride of mercury constituting the more important internal remedies; leeches, blisters, and sorbefacients the most reliable topical ones. If matter forms, it should be promptly evacuated, disorganized ganglions being destroyed with escharotics. If the disease proves intractable, the altered mass should be extirpated.

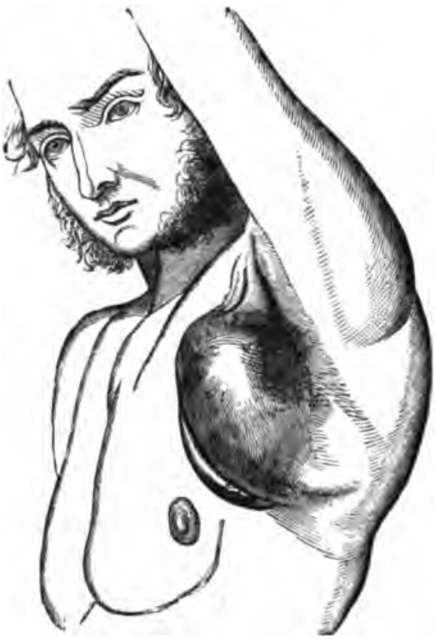
The *encysted tumor* occasionally occurs in the axilla; generally as a congenital affection, of a rounded, semi-globular form, soft, fluctuating, free from pain, and filled with a watery, coagulable fluid. An interesting case of this kind, in a stout and otherwise healthy child, six months of age, was sent to my clinic at the Jefferson College in 1861, by Dr. Conry, of Manayunk. The sac, which contained about four ounces of limpid serum, was laid freely open, and its inner surface thoroughly mopped with a weak solution of iodine. The operation was followed by a speedy cure.

Malignant growths of the axilla, as primary affections, are most common in elderly subjects, and the form in which they usually appear is that of *encephaloid*, commencing as a small, nodulated tumor, which often, in the course of a few months, acquires an immense bulk. The mass feels hard, or hard at one place, and soft at another, and, although movable at first, soon becomes firmly fixed in its position, filling up completely the hollow between the arm and the chest. The subcutaneous veins gradually increase in size, and the morbid mass at length breaks and gives way, forming a fungous, bleeding ulcer, the seat of a more or less copious, fetid discharge. The general health, in the meantime, is greatly impaired, the corresponding limb is stiff and œdematous, and the system is racked with pain. Death usually occurs in from twelve to eighteen months. Mr. Butcher, of Dublin, has described two cases of enormous encephaloid tumors of the axilla, in both of which the pleuritic cavity on the affected side contained at least a gallon of watery fluid.

Scirrhus of the axilla is generally the result of secondary involvement in connection with carcinoma of the breast; as an independent disease, it is very uncommon. The tumor, which sometimes acquires a large bulk, as in fig. 709, from Erichsen, usually extends further down the chest than in encephaloid, and is always the seat of sharp, lancinating pain, which, together with its history, form, and consistence, and the absence of enlargement of the subcutaneous veins, serves to distinguish it from soft cancer.

The only remedy for these diseases is extirpation. The operation, however, besides affording the merest temporary relief, is one of great delicacy, from the fact that the axillary vessels and nerves are often involved in the morbid mass.

Fig. 709.



Scirrhus of the axilla.

In performing operations upon the axillary region, special care must be taken not to wound the axillary vein, inasmuch as such an accident might be followed by fatal consequences from the introduction of air, as happened to Dupuytren, Wattmann, John C. Warren, Clemont, and others.

Great uncertainty often prevails regarding the *diagnosis* of the affections in this situation. Thus, for example, surgeons have occasionally mistaken an aneurism of the axillary artery for an abscess. Ferrand, Desault, Dupuytren, and Syme, each committed an error of this kind, followed in all, except the latter, by death. On the other hand, a solid tumor may be confounded with an aneurism. Pelletan and Nicoll each ligated the subclavian artery in a case of encephaloid under the supposition that the malady was aneurism. Both patients perished. Such blunders—for this is the mildest term that can be applied to them—should serve to put surgeons upon their guard in reference to the diagnosis of diseases of the axillary region.

5. BANDAGES FOR THE SUPERIOR EXTREMITY.

Bandaging of the *fingers* is a very nice operation; it is particularly called for in inflammation after fractures of the radius and ulna, and in case of burns and scalds, with a view to the prevention of adhesions. The roller should be from three-quarters of an inch to an inch in width, and should be carried up, by circu-

Fig. 710.

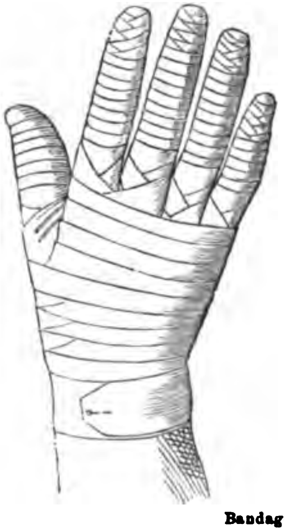
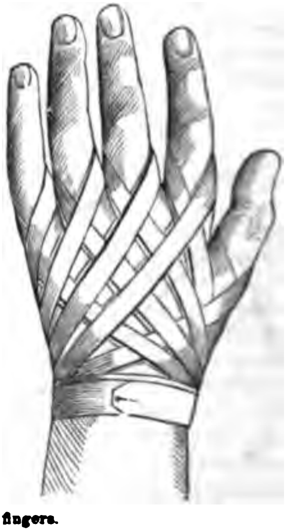


Fig. 711.



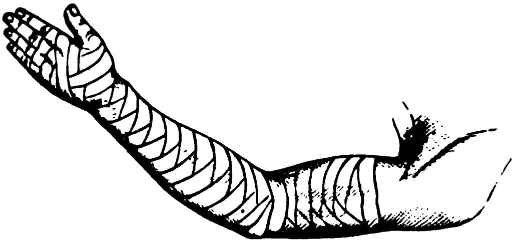
Bandages for the hand and fingers.

lar and reversed turns, as far as the root of each member, when the extremity should be stretched across the back of the hand, which, when all the fingers are enveloped, should be surrounded with a broad bandage, extending from the knuckles a short distance beyond the wrist, as exhibited in fig. 710.

For retaining dressings upon the *hand*, the bandage represented in fig. 711 is usually employed. It consists of a roller, an inch in width, and several yards in length, carried, first, round the wrist, and afterwards across the carpus, in front and behind, in such a manner as to embrace the root of each finger.

The most suitable bandage for the *forearm and arm* is the ordinary roller, fig. 712. The application, commenced at the fingers, is gradually continued up the limb as far as the elbow, and thence up as high as the axilla, where the end is fastened with a pin. Sometimes, as when it is desired to secure the arm to the side, the bandage may be carried horizontally round the trunk. The hollow of the hand may, if necessary, be filled up with cotton, lint, or old muslin. Great care must be taken in carrying the bandage round the elbow, otherwise it will be apt to lose its hold or to produce undue compression. The usual length of the roller for the upper extremity is from six to eight yards, its width being about two inches and a quarter. In cases of fractures and other injuries, likely to be followed by severe swelling of the hand, the thumb and fingers should be put up in separate bandages.

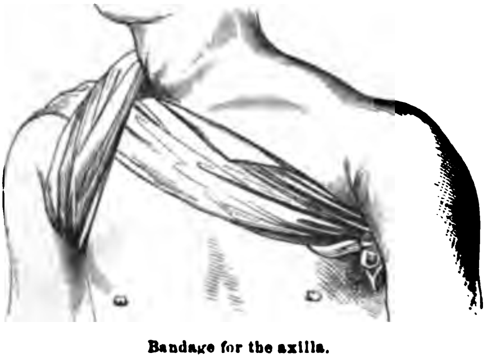
Fig. 712.



Roller for the superior extremity.

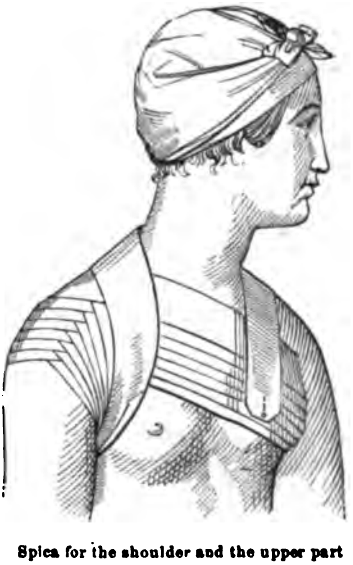
For confining dressings in the treatment of wounds, abscesses, and other affections of the *axilla*, the most simple and efficient contrivance that can be used is a large handkerchief, folded cornerwise, the centre being placed under the arm, and the ends, crossed over the shoulder, carried round the chest, and tied under the opposite axilla, as illustrated in fig. 713.

Fig. 713.



Bandage for the axilla.

Fig. 714.



Spica for the shoulder and the upper part of the arm.

The *spica* bandage for the shoulder and the upper part of the arm, represented in fig. 714, consists of a roller from eight to ten yards in length by two inches and a half in width, with compresses for the axilla of the affected side. Leaving about two feet and a half of the end of the bandage pendent at the posterior part of the arm, the application is commenced by several spiral and reversed turns round the limb, passing from its outer towards its inner surface. The bandage is then carried up over the outer aspect of the shoulder, obliquely across the anterior part of the chest, to the axilla of the sound side, and thence across the back to the affected shoulder. In this manner one turn after another is made, each succeeding one partially overlapping the preceding one, until the roller is consumed, when the initial extremity at the back part of the limb is brought round under the axilla, and thence over the front of the shoulder and round the back of the neck to the sound side, where it is secured by a pin.

SECT. II.—INFERIOR EXTREMITY.

1. AFFECTIONS OF THE FOOT AND TOES.

The foot and toes, like the hand and fingers, are liable to various affections, either congenital or acquired. Among the former are supernumerary, webbed, and hypertrophied toes, flat-foot, and club-foot; among the latter, corns, bunions, podelkoma, pododynia, and certain diseases of the toes.

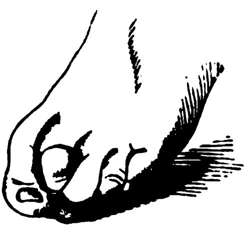
CONGENITAL AND OTHER DEFORMITIES OF THE TOES.

It is very seldom that we meet with congenital absence of the toes; *supernumerary toes*, on the contrary, are not very uncommon, the additional member being usually connected with the large toe, which it closely resembles in shape, but does not equal in bulk. The anomaly sometimes occurs on both feet, and cases are met with where it coexists with an additional thumb. The supernumerary member is not only unseemly, but, by increasing the width of the foot, may seriously interfere with the patient's comfort and convenience. Hence, it should always be removed soon after birth. The operation is very simple, the only care required being to take away the whole of the anomalous toe, and to leave a sufficient amount of integument to afford a good covering for the exposed surface.

A *webbed* condition of the toes is uncommon, and rarely affects more than two or three of these pieces. I have seen only two cases in which all the toes were thus united. The remedy is the same as for webbed fingers.

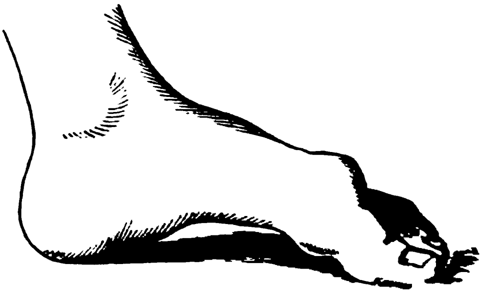
Hypertrophy of the toes is still more uncommon than hypertrophy of the fingers. It is usually congenital, and the affected parts may acquire a very large bulk, thus greatly interfering with the comfort and convenience of the foot. The proper remedy is removal of the offending structures, as it would be worse than useless to waste time upon compression and other sorbefacient means.

Fig. 715.



Deformity of the second toe.

Fig. 716.



Deformity of the great toe from inflammation of the metatarso-phalangeal joint.

Deformity of the toes occasionally arises from the effects of rheumatism, from paralysis, or from the wearing of a tight shoe, causing them to project in an unseemly and inconvenient manner, either above or below the natural level, as in fig. 715, or producing an incurvated, claw-like appearance. The immediate cause of the distortion is a contraction of the tendons of the flexor muscles, which should accordingly be divided, as they pass beneath the first phalanx, by subcutaneous section, the faulty toes being afterwards treated in the extended posture by splint and bandage, until they are completely straight. When the great toe is mainly involved, as generally happens when the affection is induced by paralysis, or by inflammation of the metatarso-phalangeal joint, as in fig. 716, it may be necessary to divide the long flexor in the sole of the foot; but, in doing this, proper care must be taken to keep the knife close to the affected tendon, made previously as tense as possible, otherwise the internal plantar artery might suffer.

CORNS.

Corns consist in an indurated and hypertrophied condition of the cuticle, caused by inflammatory irritation of the superficial portion of the dermis, and a consequent effusion of lymph. They affect different parts of the toes and feet, and are generally produced by wearing tight shoes and boots, whereby these organs are habitually compressed and even forced out of their normal position. A short, tight stocking occasionally produces a similar result. Corns are very variable in regard to their size, form, and consistence. They are usually distinguished into hard and soft.

Hard corns are dry, scaly, insensible callosities, occurring mostly on the dorsal surface of the toes, opposite the middle joints. All these structures are occasionally affected, but the great and little toes suffer much more frequently than any of the rest. These bodies are met with also in the sole of the foot, in the hollow or arch, and on the under part of the heel. Occasionally a very hard corn is found under the nail of the big toe, or between the nail and the fleshy flap of the toe.

A hard corn, when fully developed, is lamellated, firmer at the centre than at the periphery, and furnished with a kind of nucleus, of a whitish, horny appearance, not unlike the eye of a fowl. A small, but distinct burse, containing a minute quantity of serous fluid, and sometimes a drop of blood, is almost always interposed between it and the dermis. The hard corn frequently consists of three or four layers; it is commonly of a circular shape, is either fixed or movable, and varies in size from the head of a pin to that of a dime. In many cases it has a kind of radiated root.

The hard corn, from a continuance of the pressure by which it is produced, becomes gradually a source of pain and tenderness, which are much increased by exercise, and are often accompanied by heat and swelling of the whole foot. In time the burse under the horny cuticle inflames, and pours out an unusual quantity of fluid, which distends the sac, and thus greatly aggravates the suffering. When matter forms, the pain becomes excruciating, the slightest touch is intolerable, and the patient is unable to use the limb. In such cases the lymphatic vessels are sometimes inflamed as high up as the groin.

Soft corns are always situated between the toes, usually opposite a joint or at their angle of union, and derive their characteristic feature from being in a constant state of moisture, from the perspiration which collects between these parts; they are usually superficial, and are produced by wearing very narrow-soled shoes, by which the toes are habitually squeezed together, bent at their articulations, or forced over or under each other. For this reason ladies are more subject to this variety of corn than men or the poorer classes of females. The soft corn is of a circular or oval figure, of a whitish, yellowish, or grayish color, with a radiated or horny-looking nucleus, and seldom larger than a split-pea or half a dime. Occasionally it is broad, oblong, flat, and of a dark color, from the presence of extravasated blood. In some instances, especially in old people and in cases of long standing, the corn is very hard at the centre, has a small synovial burse, and consists of several distinct layers. From being constantly compressed, it is very painful, and remarkably prone to inflammation, suppuration, and even ulceration.

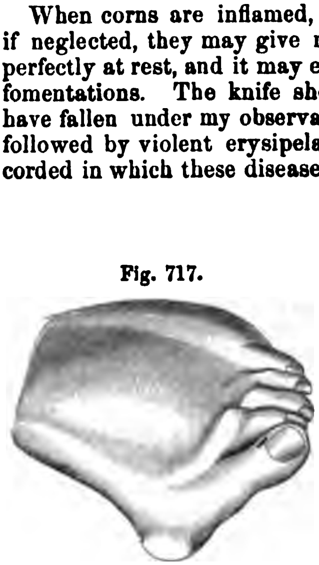
The *treatment* of corns consists in scraping away the thickened cuticle, and lightly touching them with nitrate of silver, or tincture of iodine, which may be repeated occasionally until the cure is completed. This may be greatly expedited by washing the feet night and morning with cold water and soap, and afterwards rubbing them well with a soft, dry towel. The shoe, which should have a low, broad heel, should be accurately adapted to the shape of the limb, and all undue pressure carefully avoided, even from the seam of the stocking. When the toes are much deformed, or incurvated, they are to be kept apart by pledgets of lint, a piece of soft sponge, or strips of adhesive plaster passed from one to the other. When this cannot be done from their fixed position, amputation may become necessary. In some instances it is useful to make the patient wear a stocking constructed on the principle of a glove, each of these organs having a separate stall. A shoe made of buckskin or cloth sometimes affords great relief.

When corns are very tender, they should be frequently scraped with a blunt knife, and kept constantly covered with a piece of soap plaster, or a bit of linen spread with simple cerate to prevent them from becoming hard and dry. In some instances the pressure may be warded off by letting the corn project through a hole in the plaster, which ought then to be very thick, or consist of several layers. When the corn is seated in the sole of the foot, and this treatment is employed, it must be first covered with a piece of adhesive plaster, otherwise the weight of the body will cause the flesh to bulge into the opening, and thus produce severe pain in walking. Occasionally it is necessary to cut a hole in the boot or shoe, or to wear a felt sole with a hole in it, to protect the corn from pressure and friction. All these means, however, are merely palliative, and, when they fail, nothing short of complete eradication will answer. The operation, which is seldom painful, is performed with a small narrow-pointed scalpel and pair of forceps, care being taken not to injure the sensitive skin beneath, and to soften the corn by previous immersion in warm water. When an abscess forms, it should be opened as speedily as possible, after which the offending part may be removed, or this may be postponed to another day. Sometimes the matter escapes by ulceration, leaving a fistulous sore with thick, irregular edges, and constantly bathed with a thin, ichorous fluid. In such a case nitrate of silver constitutes the best remedy.

When corns are inflamed, they cannot be treated with too much care, since, if neglected, they may give rise to serious mischief. The foot should be kept perfectly at rest, and it may even be necessary to resort to leeches and medicated fomentations. The knife should be used most cautiously. Several instances have fallen under my observation in which the cutting of an inflamed corn was followed by violent erysipelas and mortification; and numerous cases are recorded in which these diseases, thus occasioned, have caused death.

BUNIONS.

Fig. 717.



Bunion.

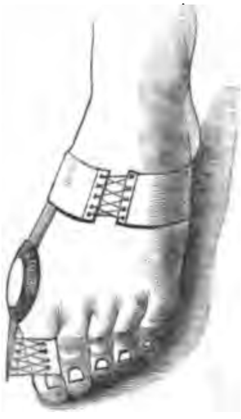
A bunion is a corn on a large scale, caused in a similar manner, having a similar structure, and requiring a similar treatment. It consists in a thickening and induration of the common integument over the first metatarso-phalangeal joint, accompanied by a malposition of the great toe, which is usually forced inwards, either against, over, or under the adjoining one, thus occasioning a sharp, angular projection on the outside of the articulation. These appearances are well shown in fig. 717, from a female patient. The whole difficulty is originally dependent upon the wearing of a short, narrow-soled, high-heeled boot, by which the whole weight of the body is thrown upon the anterior part of the foot in progression. A similar tumor sometimes forms over the first joint of the little toe. Hereditary malformation, preternatural laxity of the ligaments, and a gouty or rheumatic state of the system, may be mentioned as so many predisposing causes of the complaint.

The cuticle, when the disease is somewhat advanced, is thick, scaly, or lamellated, hard, brawny, and, at times, studded with superficial corns; the subjacent burse, which is often of large size, contains a considerable quantity of synovia; and the corresponding joint of the toe is always chronically inflamed and hypertrophied, if not partially anchylosed. Exercise is painful, and never fails to aggravate the disorder, not unfrequently occasioning erysipelas of the foot, and abscess in the sac of the bunion.

The *treatment* is palliative and radical. The first thing is to procure a proper shoe, in order to diffuse the pressure over the foot, instead of concentrating it upon the toes. Pain, tenderness, and inflammation are best relieved by rest and elevation, along with leeching, blistering, and cold water, medicated with laudanum and acetate of lead. If matter forms, an early and free incision is made down to the bones.

The malposition of the toe may generally be easily rectified, in the slighter cases, by strapping it, from time to time, to the anterior extremity of a trough of sole leather, carefully moulded to the inner margin of the foot, and laced to the instep and heel by appropriate bands. By this arrangement the metatarsus is made to serve as a fulcrum keeping in check the action of the adhesive plaster by which the toe is gradually reduced to its natural situation. When the deformity is more considerable, recourse may be had to the apparatus of Mr. Bigg, represented in fig. 718. It consists simply of a delicate lever of steel, with an oval ring in the centre, and attached by a laced band to the instep. At the anterior and posterior margins of the ring is an ordinary hinge-joint, allowing the articulation to move freely in the natural plane, but calculated to oppose any lateral tendency. The toe is secured to the extremity of the apparatus by a piece of webbing. The patient will generally be able to wear a shoe without any difficulty.

Fig. 718.



Apparatus for the treatment of bunion.

A radical cure may be effected by excision of the sac, but, unless the part and system have been well prepared, the operation may prove dangerous from its liability to be followed by erysipelas. A much safer plan is to divide the sac subcutaneously with a delicate tenotome, cutting it up into numerous fragments, and then pencilling the surface of the swelling several times a day with tincture of iodine. I have practised this method in numerous cases with highly gratifying results. Amputation through the metatarsal bone may become necessary when the parts are hopelessly crippled, and the seat of constant suffering.

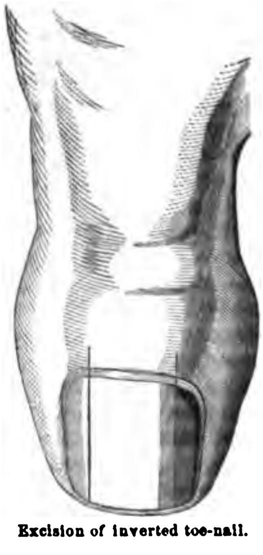
INVERSION OF THE NAIL OF THE GREAT TOE.

The big toe is subject to the inversion of its nail, consisting, as the name implies, in an ingrowing of its edges into the common integuments. The affection is productive of severe suffering, and is, therefore, as well as on account of the frequency of its occurrence, deserving of particular attention. It is not peculiar to the big toe nail, although it is most common here, and it is here, also, that it has been best studied. It is most frequent in young adults, and occasionally exists in several members of the same family. Several cases have come under my observation where it began very early in life, under circumstances which induced me to believe that it might have been hereditary. Thus, I know two instances where a mother and two of her children are all afflicted with the disease.

The affection consists essentially in a vicious formation of the nail, in consequence of which its edges become incurvated, and pushed down into the skin at the margin of the toe, which thus overlaps them. This often happens with the hardest as well as with the softest nail. The incurvation generally exists on both sides, though rarely in an equal degree, and we sometimes meet with cases where both the big toes are involved. When the affection is fully developed, the edge of the nail dips into the flesh almost vertically, leaving a well-marked gutter upon the removal of the offending part. Long, however, before it has attained this height, it becomes a source of severe suffering, on account of the pressure which it exerts upon the soft structures at the side of the toe, which at first inflame and swell, and afterwards ulcerate, the sore discharging a foul, fetid fluid, and being usually covered with tender, fungous granulations. In some cases, the inflammation involves nearly the whole toe, which is then proportionately painful, and thus greatly augments the distress; so that, at length, the patient is in constant misery, and hardly able to wear a shoe or take any exercise. The habitual use of a tight, narrow shoe, causing severe lateral pressure, no doubt often contributes to the production of this affection, but most commonly it arises from the vicious manner in which the nail is cut down at the edges, thereby allowing the thickened and indurated integument to rise above the level of the nail, which always grows more slowly than the other structures, in which, consequently, it is ultimately buried. Once formed, it is extremely difficult to get rid of it. Great convexity of the nail no doubt acts as a powerful predisponent.

Various methods of *treatment* have been suggested for the cure of this affection, most of which can hardly be regarded even as palliatives. Paring the inverted portion of the nail occasionally with a sharp knife, and removing the callous skin by its side, will always afford marked relief, and may, if steadily persisted in, sometimes eradicate the evil, but, in general, it will soon return, and ultimately call for more decisive procedure. Scraping the back of the nail, so much lauded by some surgeons, is commonly useless, as it is hardly productive even of transient comfort. Dr. Robert Campbell, of Georgia, recommends systematic compression with a small compress and roller, but the operation, without being by any means free from pain, is troublesome and tedious, from six to eight weeks being required to effect a cure, and even then it is seldom, if ever, permanent. When the affection is fully formed, and the patient's time is valuable, the best plan is at once to excise the offending portion of the nail, chloroform being given to prevent suffering, which will otherwise be excessive. With a stout, narrow, and very sharp scalpel, the nail is divided through its whole length, as seen in fig. 719, down almost to the bone, on a line with the incurvated edge, which is then rapidly detached, root and all being embraced in the dissection. Very little bleeding ordinarily attends the operation, which is over in a few seconds. Warm water-dressing is applied, and the foot is kept at rest until the wound is measurably healed. I generally excise both margins at the same time. By this procedure, a large portion of the nail is left for the protection of the toe, and a radical cure is effected. Everything else is merely palliative, the patient being at last obliged, perhaps after long suffering, to submit to the knife. The barbarous practice, formerly so fashionable, of removing the entire nail for the relief of this affection cannot be too much condemned.

Fig. 719.

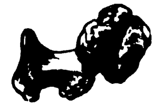


Excision of inverted toe-nail.

EXOSTOSIS OF THE GREAT TOE.

The last phalanx of the great toe, as seen in fig. 720, is sometimes the seat of an exostosis, so large as to cause serious inconvenience and pain in walking. It may appear at various points of the bone, but generally it is seated on its upper surface, partly under the nail, which, in time, it lifts up and partially destroys by ulceration. Its form is spherical or pyramidal, and in size it varies from that of a millet seed to that of a hazelnut, its structure and consistence resembling those of the natural osseous tissue. Arising generally without any assignable cause, its origin is usually ascribed to a blow, or to the pressure of a tight shoe; it is most common in young adults, is slow in its progress, and is amenable to excision with a stout knife, aided, if necessary, by the saw. Amputation of the phalanx is not to be thought of unless the whole bone, nail, and soft parts are involved in destructive ulceration.

Fig. 720.



Exostosis of the distal phalanx of great toe.

CLUB-FOOT.

Club-foot consists in a peculiar distortion of the foot, attended with a deviation from its natural direction, and also, generally, with a diminution of its proper length. Presenting itself in various degrees, the deformity to which it gives rise is sometimes so great as to occasion the most disagreeable disfigurement and the most painful inconvenience, rendering the individual an object of constant attention and remark, as well as sadly interfering with the function of progression. Hence it is not surprising that it should always have attracted the notice and enlisted the sympathy of medical men, inducing them to investigate its nature and causes, and to devise means for its successful relief.

Club-foot is for the most part a congenital affection. It may, however, be developed after birth, and even at an advanced period of life, from the foot being accidentally placed in a constrained position, and so retained until the soft structures, particularly the muscles and ligaments, are moulded into a new shape, or thoroughly fixed in their new relations. Various mechanical causes may give rise to it, as splints and bandages, by which the parts to which they are applied are injuriously compressed, or forced out of their normal position. Similar effects are produced by convulsions, dentition, nervous irritation, contusions, sprains, fractures, partial luxations, and preternatural laxity of the ligaments. Sometimes the defect is occasioned by the presence of a corn, an ulcer, or some other disease which induces the person to walk on one side of the foot, the tip, or the heel, to ward off pressure from the tender parts. A vicious habit is thus established, which, if continued for any length of time, as it frequently is, inevitably leads to irregular action of the muscles, and to distortion of the bones into which they are inserted.

Etiology.—The etiology of congenital club-foot has never been satisfactorily explained. The hypothesis of arrested development, so warmly advocated by some modern pathologists, is altogether untenable, being essentially contrary to the facts of the case in every particular. The imperfect growth, if any such really exist, is not congenital, as this doctrine teaches, but acquired, being the result of causes which are brought to bear upon the child during its intra-uterine life, leading to shortening and contraction of certain muscles, and not to a want of development properly so called. It must be acknowledged, however, that instances occasionally do occur, although rarely, which strongly favor the doctrine under consideration. Thus, I have, in my own practice, seen two infants born at the full term, but who died immediately after birth, who had each well-marked hare-lip, cleft-palate, and club-foot, the result evidently, so far at least as we can judge of such an occurrence, of an arrest of development.

Another hypothesis of the formation of club-foot that has met with considerable notoriety, is that the distortion is caused by the pressure of the uterus upon the feet of the infant during gestation, in consequence of a deficiency of the amniotic fluid. But, the question may be asked, if such an effect may be exerted by this organ upon the feet, why should it not be exerted also upon the hands, head, nose, chin, legs, and knees? Such a coincidence, supposing the doctrine to be true, ought to be of constant occurrence, and yet it is so rare that it is probably not noticed once in a hundred cases of the affection. Besides, it remains to be proved that women who bear club-footed children have always a deficiency of amniotic liquor.

The most plausible view, perhaps, that can be framed, in the present state of the science, of the formation of club-foot, is that it is produced by a defect of nervous influence, leading to a permanent contraction of certain muscles, with a corresponding retraction and incurvation of the bones into which these muscles are inserted. This hypothesis, for it is nothing else, derives corroboration from what occurs in strabismus, in which the straight muscles of the eye frequently almost in an instant, simply from irritation, or an attack of convulsions, lose their parallelism, without the ability afterwards to regain it except by an operation. Here the contraction of the muscles must be the direct result of a lesion of innervation, or perverted nervous action; for the effect is generally too rapid to justify the conclusion that it can possibly be due to inflammation, which has sometimes been invoked as its exciting cause. How a lesion of the nerves can be produced in the fœtus in the womb is of course inexplicable; but that it does occur, in various forms and degrees, is a fact clearly established in pathology. It is worthy of remark, in connection with this hypothesis, and as strikingly confirmatory of it, that congenital club-foot has been repeatedly met with in the embryo as early as the third and fourth months. Moreover, it is not unfrequently associated with imperfect development of the cerebro-spinal axis, or of certain classes of nerves, and with an atrophied and contracted state of the muscles in different portions of the body, especially of the back, shoulder, and hand.

The congenital variety of club-foot often affects both feet, though rarely in an equal degree. The relative proportion, however, of double to single club-foot has not been determined; and the probability is, judging from recorded facts, that it varies materially in the practice of different surgeons. In my own hands the number of cases of single club-foot has considerably exceeded—perhaps in the proportion of three to two—the number of double cases. In 167 cases, reported by Dr. Detmold, of New York, the distortion occupied both feet in 93. At the Orthopædic Hospital, London, the two affections are said to occur almost with equal frequency. When the distortion is single, it involves the right foot a little oftener than the left. Both sexes are liable to club-foot, but males suffer more frequently than females, probably, if I may judge from my examination of the subject, in the proportion nearly of two to one. Some very remarkable cases have been recorded of the occurrence of this distortion in different members of the same family. In one instance, observed by Held, all the children, six in number, were the subjects of congenital club-foot; and its history renders it probable that the affection was hereditary, since one of the parents was laboring under a similar infirmity. The transmissibility of this variety of deformity has been insisted upon by most writers on club-foot, and there are certainly just grounds for such an opinion; still, the occurrence is extremely uncommon.

Varieties of Form.—Club-foot presents itself under several varieties of form, of which there are four principal ones, differing from each other not only in regard to the character of the distortion and the accompanying phenomena, but likewise in relation to the frequency of their occurrence, and the nature of their treatment. These may be respectively denominated the inverted, everted, phalangeal, and calcaneal varieties, each name having reference to the manner in which the limb touches the ground in standing or progression. Thus, in the inverted club-foot the inner margin of the foot is inclined upwards, while in the everted it is turned downwards; in the phalangeal variety the heel is elevated, and in the calcaneal it is depressed, the toes in the former case being, of course, turned down, and up in the latter. Besides these varieties there are several subdivisions, depending upon a combination of two of the principal forms, as, for instance, the inverted and phalangeal, which is extremely common, and the inverted and calcaneal, which is more rare.

The most common form of club-foot by far is the *inverted*, usually denominated *varus*, figs. 721 and 722, in which the patient walks upon the outer ankle, the great toe being directed inwards and upwards. The muscles of the calf and the adductors of the foot are contracted, and hence there is not only elevation of the heel, but a peculiar inward twist of the foot, analogous to supination of the hand. This alteration occasions the most serious impediment to progression, and when it reaches its highest point imparts a most disagreeable aspect to the affected limb. In the more severe grades of the disorder, the sole of the foot is literally scooped out, as it were, as well as deeply furrowed; the instep, on the contrary, is unusually convex and prominent; the small toes generally present in a vertical position, while the big one, separated from the rest, looks upwards and inwards; the outer margin of the foot, which, in conjunction with the corresponding malleolus, chiefly sustains the weight of the body, is almost semicircular in its shape, rough, and callous; and the tendo-Achillis, forced obliquely towards the inner side of the leg, forms a tense, rigid cord beneath the skin.

Fig. 721.

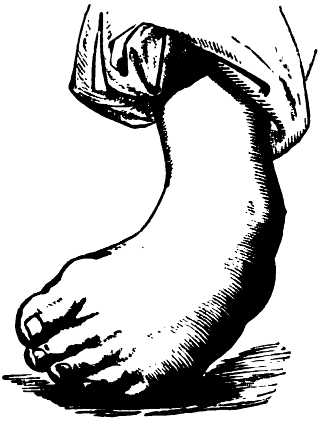
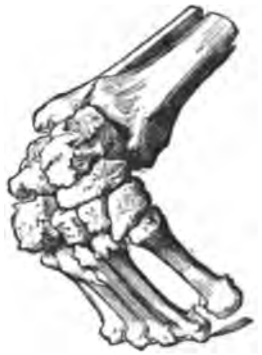


Fig. 722.

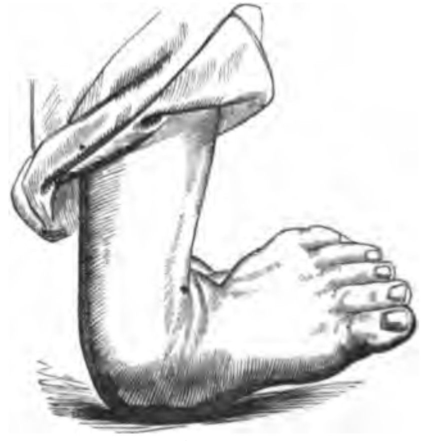


Varus.

When, as not unfrequently happens, both feet are affected with varus, their points may form an acute angle with the leg; or they may approach so nearly as to touch, and even overlap each other. In the majority of cases the thigh and leg retain their natural conformation, being merely somewhat atrophied; occasionally, however, the knees project slightly inwards or outwards, in consequence of the contraction of the hamstring muscles.

The second variety of this deformity, anciently called *valgus*, fig. 723, may be regarded as the opposite of varus, the patient treading on the internal margin of the foot, while the external is entirely removed from the ground. The sole is directed outwards and slightly backwards, the toes are more or less elevated, and the outer ankle is in a state of semi-flexion. The heel is drawn

Fig. 723.

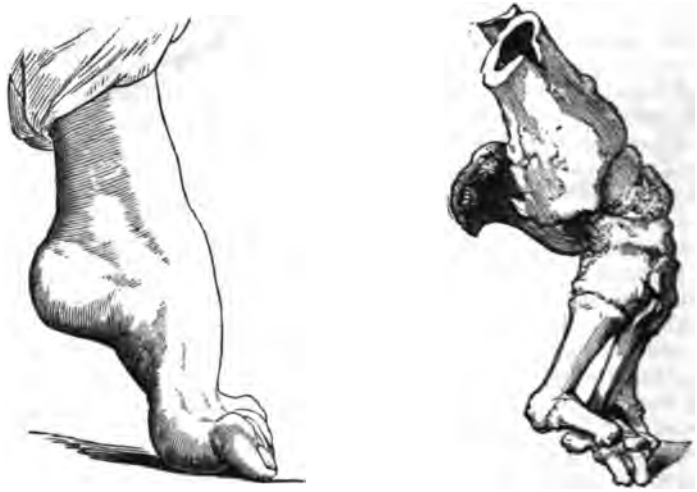


Valgus.

upwards and somewhat outwards, the internal malleolus is uncommonly prominent, the instep is flatter than natural, and the muscles of the calf, together with the abductors of the foot, are permanently contracted. When the disease has attained its highest point, the patient has an unsteady, vacillating gait, from the difficulty which he experiences in preserving his centre of gravity. Valgus is comparatively rare; like the first variety of the distortion, it may affect one or both limbs. It is seldom congenital, but is almost always produced by some local injury, as a sprain, blow, or contusion. The most simple form of the affection constitutes what is called flat-foot.

The phalangeal variety of club-foot, figs. 724 and 725, the *pes equinus* of the older writers, is caused by a shortening of the gastrocnemial and soleal muscles, aided, in some cases, by the flexor of the toes. It is nearly always a non-congenital affection.

Fig. 724. Fig. 725.

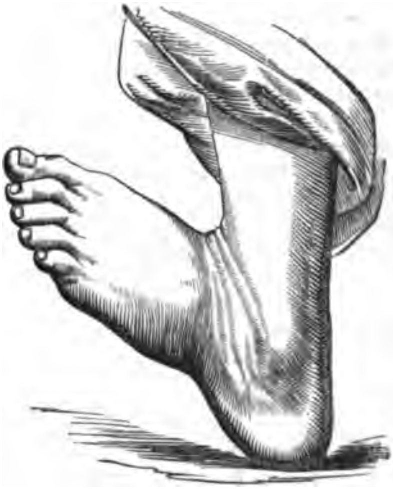


Equinus.

In this species of the deformity the individual walks upon the ball of the foot, the toes, or the metatarso-phalangeal articulations, without the heel or any other part of the sole touching the ground. The distance to which the heel is raised varies in different cases, from six lines to four or five inches, according to the extent of the contraction upon which the distortion depends. Considerable diversity is observed in regard to the manner in which the person treads on the ground; most commonly the ball of the little toe bears the brunt of the pressure, but in some instances the weight is thrown upon the great toe, or it is diffused over the whole of the forepart of the plantar surface. In the worst grades, the heel is so much elevated that the foot forms nearly a straight line with the leg, the toes are much deformed, and perhaps retracted, if not doubled under, the instep is unnaturally convex, from the projection of the astragalus, the plantar aponeurosis is greatly contracted, and the skin above the heel is thrown into large, dense wrinkles. Phalangeal club-foot, without any complication with the other forms of the affection, is exceedingly rare.

In the fourth variety, the *calcaneal*, fig. 726, the limb rests upon the heel, the toes being drawn upwards towards the anterior surface of the leg, with which they sometimes form an acute angle. The immediate cause of the deformity is a contraction of the anterior tibial muscle and of the extensor of the great toe, assisted occasionally by that of the common extensor of the foot. The tendons of these muscles form an evident protuberance under the skin, where they present the appearance of tense, rigid cords, which powerfully resist the flexion of the limb. The inner margin of the foot, as seen in the cut, is sensibly elevated above the outer, and there is always considerable atrophy of the leg. The distortion, which is almost constantly congenital, is exceedingly rare. I have seen only a few cases of the non-congenital variety. The most remarkable one was that of a young female, who, in consequence of an ulcer on one of the toes, had got in the habit of walking on the heel, until at length the parts became rigidly fixed in their abnormal position. Occasionally the foot inclines slightly outwards, owing to the inordinate contraction of the common extensor muscle.

Fig. 726.



Calcaneus.

The changes which the bones, ligaments, and muscles undergo, vary, not only in the different species of club-foot, but in the different stages of the same case. The greatest alteration appears to exist on the part of the tarsal bones, which, although they are rarely completely dislocated, are generally somewhat separated from each other, twisted round their axes, variously distorted, atrophied, or marked by irregular spicules or exostoses. The calcaneum, cuboid, scaphoid, and astragalus always suffer more than the other bones; which, however, as well as those of the metatarsus and of the toes, usually participate, more or less, in the deformity. The ligaments, in recent cases of club-foot, do not present any material changes, but in those of long standing, or in the higher grades of the affection, they are invariably stretched in the direction of extension, and relaxed in that of flexion. In some instances the original structures are partially replaced by bands of new formation, of a dense fibrous character, the volume and resistance of which vary according to the duration of the disease, and the pressure of the parts which they serve to connect. The muscles also are not much altered in the first instance, except that they deviate from their natural direction, and that, like the ligaments, they are elongated, on the one hand, and shortened, on the other. In ancient cases the whole limb is always considerably wasted, and many of the muscles are remarkably thin and pale, or even transformed into soft fatty bundles. The cellular substance is condensed and diminished in quantity; the fat is absorbed; and even the vessels and nerves supplying the affected parts are reduced in volume. The skin of the foot which receives the principal brunt of the pressure in standing and walking, is generally very much thickened and indurated, and large synovial burses are often formed beneath it, which are apt to inflame, and thus add to the suffering of the patient.

Treatment.—The treatment of club-foot should always receive early and efficient attention, for the longer it is deferred the more difficult it will be, other things being equal, to effect a cure. This is equally true of the congenital as of the accidental form of the affection. The bones in early life, and in recent cases of deformity, are much more easily restored to their normal position than in youth and adolescence; and the muscles also regain much sooner, as well as more completely, their native power. In the worst grades of the lesion, it is generally extremely difficult, if not impossible, when treatment has been neglected until after the age of puberty, to make a satisfactory cure without the division of a considerable number of tendons, and the necessity of compelling the patient to wear, for a long time, various kind of apparatus.

The precise period at which the treatment should be commenced has been variously defined by different authorities. Provided the infant is healthy, my custom has long been to begin it as early as the end of the second month, and, unless the case is very bad, I have rarely found it necessary, at this early period, to do more than confine the limb in a well-adjusted apparatus, worn steadily day and night. If the distortion is considerable, I invariably employ the knife as a preliminary measure, and this may always be done with the most perfect safety, even within the first four or five weeks.

Different kinds of apparatus are in vogue for the cure of club-foot, and it is, therefore, not always easy for the practitioner to determine which is the best, or which should be employed to the exclusion of others. Every orthopædic surgeon, almost, has some peculiar notions upon the subject, which induce him to adopt such measures as whim, fancy, or experience may dictate. This very circumstance, however, goes to show that the same end may be attained by different means. Whatever plan be adopted, the great caution to be observed, on the part of the surgeon, is that the extension be made in a slow and gradual manner, that the skin be protected from friction and unequal pressure, that the dressing be worn day and night, and, finally, that the limb be frequently washed, and immediately afterwards rubbed with some mild sorbefacient lotion. The object of these instructions is self-evident, and must be constantly borne in mind in our curative procedures. During the first few days, the apparatus should be applied rather loosely, until the limb has become accustomed to its presence, when it must be gradually tightened. If the skin becomes chafed, hot, and tender, measures must immediately be adopted to moderate or shift the pressure, or the apparatus must be left off altogether for a few days. In young children, the integument is so delicate that, unless the greatest caution is used, the foot may be seriously injured before any one is aware of what is going on. By inattention to this rule, I have sometimes seen deep ulcers produced, which greatly interfered with the subsequent management of the case.

The time required for restoring the limb to its normal position must necessarily vary in different cases, and must depend upon so many circumstances as to render it impossible to lay down any specific rule. From two and a half to six months, however, may be regarded as a fair average, though occasionally a much longer period will elapse, even under the most unremitting attention. The division of the faulty tendons generally materially expedites the cure, and should always be promptly resorted to the moment it is found that the case is likely to prove obstinate. Indeed, I am not sure whether it would not be well, in almost every case, however simple, to resort to tenotomy as a preliminary step.

In the milder forms of varus, or the inverted variety of club-foot, I have often succeeded in effecting complete cures, in a very short time, by the use of adhesive strips, aided by a long splint for the outer part of the leg, arranged on the plan of that of Dupuytren for fracture of the fibula. The strips should be from an inch to an inch and a quarter in width, and long enough to reach as high up as the knee, or even to the lower third of the thigh. Cut in the direction of the length of the cloth, they should be well stretched, to prevent their relaxation, when they should be applied so as to extend from the inner margin of the instep spirally or vertically up the limb, the foot being the while forcibly bent upon the leg by an assistant. Five or six strips will generally suffice, but occasionally I have found it necessary to employ as many as ten or twelve. They should be laid down as smoothly as possible, and be confined at suitable distances by cross slips, extending only partially round the limb, otherwise they may embarrass the circulation. A narrow roller is next applied from the toes upwards. A broad cushion, filled with cotton, bran, or horse hair, and considerably thicker inferiorly than above, is now stretched along the outside of the limb, from the middle of the thigh to the ankle, and over this a tight splint, projecting from an inch and a half to two inches below the level of the sole of the foot. The dressing is completed by securing the apparatus with a bandage, passed round the instep and ankle in the form of the figure 8, and thence by circular and reversed turns up the limb.

This apparatus, which is exceedingly simple and easy of construction, causes, when carefully used, neither pain nor inconvenience. The strips should be renewed as often as they become slack, which will be about the sixth or seventh day, when the limb should be well washed, and rubbed with some gently stimulating lotion. When the child is not more than a few months old, or the distortion is inconsiderable, a cure may generally be effected in this way in from ten to twelve weeks. As a preliminary step, I commonly divide the tendo Achillis, and also, if necessary, the plantar aponeurosis. When the apparatus is laid aside, the foot should be placed in a strong boot, made of undressed sole-leather, carefully moulded to the limb, and constructed so as to lace in front in its whole length.

Although this contrivance will often answer extremely well, its use is hardly advisable when it is practicable to obtain a properly constructed club-foot apparatus. This can, of course, always be readily done in large towns and cities; but in remote situations cutlers are seldom to be found, and it is then that the surgeon is obliged to tax his ingenuity to provide means necessary for the accomplishment of his purpose.

Mr. Richard Barwell, of London, has lately expressed himself as strongly opposed to tenotomy as a remedy for club-foot; and in a monograph published during the present year he has described and delineated an apparatus which, if properly applied, will, he thinks, be generally sufficient for effecting a speedy and permanent cure in almost every instance of this affection. His opinion is that the tendo Achillis is almost the only muscle that should ever be divided. The means upon which he mainly relies for rectifying the faulty position of the foot are, adhesive strips, longitudinal and circular; a piece of turned iron about an inch in width, as long as the child's leg, and provided at its upper extremity with a wire loop; a few India-rubber cords of various lengths by three lines in diameter; and some eyelets, with pincers for fixing them. The object of the whole proceeding is to aid the affected muscles in regaining their action upon the foot, compelling them to adapt themselves to the normal posture.

A great variety of club-foot apparatus has been constructed during the last twenty-five years, all based upon the original well-known shoe of Scarpa. The adjoining sketches, figs. 727 and 728, afford a good idea of what such a contrivance ought to be, and, under the superintendence of such a cutler as Mr. Kolbe, of this

Fig. 727.

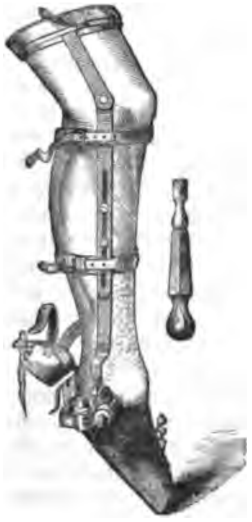
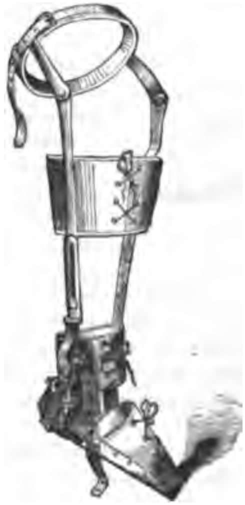


Fig. 728.



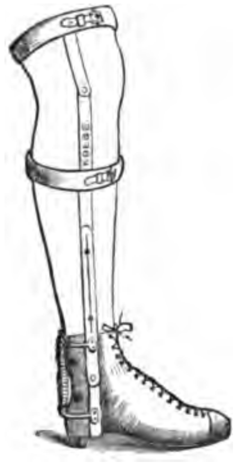
Club-foot apparatus.

city, it may readily be made with the aid simply of a plaster cast, which may now be sent by express from any part of the country. The essential elements of the apparatus are a shoe and two side-pieces, extending as high up as the lower third of the thigh, the whole being so arranged by means of screws as to permit the angle of flexion to be regulated at pleasure. The shoe, composed of soft leather, well padded, and laced in front, has a steel sole, consisting of two pieces, moved by a concealed screw, the spring of which projects at the side. In this way the foot may readily be turned to one side or the other, according to the exigencies of the case, while it is depressed or elevated by an oblique screw at the ankle, connecting the shoe with the leg-piece of the apparatus, and worked by a key, as seen in the accompanying drawing. The lateral steel rods are so constructed that they may be lengthened or shortened at will, and are fastened by means of well-padded straps, each inclosing a semicircular piece of steel behind, in order to afford proper support to the limb in that situation. They are united, opposite the knee, by a hinge-joint, to permit the full play of that articulation.

There is an apparatus, differing from the preceding chiefly in having only one side-piece, and in being worked by an endless screw, situated opposite the ankle. Its great value consists in the facility which it affords for depressing the displaced margin of the foot.

In the calcaneal form of the affection, attended with great depression of the heel and inordinate contraction of the plantar arch, the most suitable apparatus after division of the faulty tendons, is the one depicted in fig. 729. Its construction and mode of action will be understood at a glance, without the aid of any description. By means of the spring attached to the back part of the apparatus the heel is gradually forced up, and the foot proportionately lowered, until the defect is permanently remedied.

Fig. 729.



Apparatus for calcaneal club-foot.

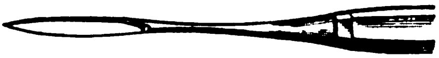
The *division* of the faulty tendons requires more care and attention than is usually imagined. Every tyro in surgery thinks he can perform it; but this is a great mistake. To do it well requires skill, judgment, and a competent knowledge of the anatomy of the foot and leg. It is this presumptuous interference that has brought so much obloquy upon the operation. In general, very little, if any, preliminary treatment is necessary. If the child, however, is several years old, and has been accustomed to much exercise, it will be well to keep him at rest for a few days before the operation, to wash the foot repeatedly with cold water, and to enjoin a light diet. The operation may then be commenced, chloroform being given or not, according to circumstances, and every faulty muscle being divided at one sitting. The position of the patient must necessarily vary according to the exigencies of the case.

The number and nature of the tendons requiring division vary with the extent and character of the distortion. Thus, in simple equinus or phalangeal club-foot, the tendo Achillis alone being concerned in producing the affection, the operation must accordingly be restricted to that cord, and the effect is generally such that, if the patient is able to walk, no apparatus will afterwards be needed to bring down the heel. Pure, uncomplicated varus requires the division of the tendon of the anterior tibial muscle, or of this muscle and of the long flexor of the toes. In the more simple forms of valgus, the tendons of the peroneal muscles are mainly concerned; while in calcaneal club-foot the distortion depends upon the contraction of the anterior tibial and common extensor muscles of the toes. In equino-varus, and in the worse forms of club-foot generally, more or less extensive division of the plantar aponeurosis is required.

Age is no bar to tenotomy. I have repeatedly performed the operation within the first two months after birth, and I should not object to it, if the child were perfectly well, and the distortion very great, within the first fortnight, though, as a general rule, it is best to wait a much longer time. Young adults are often immensely benefited, and sometimes entirely relieved, by the operation; and cases have been reported of excellent results in persons of forty and even fifty years of age.

The tenotome which I am in the habit of using is represented in fig. 730; it is nearly six inches in length, of which one inch and three-quarters are occupied by the blade. The cutting portion of the blade is spear-shaped, very sharp, thin, and a little more than five-eighths of an inch in length by two-thirds of a line in width at its widest part. The instrument, of course, makes a mere puncture in the skin.

Fig. 730.



Tenotome.

In dividing the *tendo Achillis*, the patient is placed upon his abdomen, and the limb, extended upon the table, is firmly held by an assistant. The operator, sitting in a chair, grasps the foot with his left hand, and, bending it over the edge of the table, brings down the heel as far as possible. The necessary tension being thus given to the tendon, the knife is entered flatwise between it and the deep-seated structures, a full inch above the calcaneum, and pushed on until it reaches the opposite side, care being taken that the point does not pierce the integument. The instrument is now turned in such a manner as to bring the edge of the blade against the anterior surface of the cord, which is then completely severed by pressing the handle steadily and firmly backwards, with a kind of sawing motion. The division of the parts is generally indicated by a distinct snap, and by the immediate cessation of their resistance. The operation, which is soon over, is attended with hardly any pain, and with the loss only of a few drops of blood. The only danger is the wounding of the posterior tibial artery, but this may easily be avoided simply by keeping the knife in close contact with the anterior surface of the tendon, and cutting from before backwards. The puncture may be made on the inner or on the outer side of the limb, as may be most convenient.

Professor Pancoast, instead of severing the tendo Achillis, prefers, in most cases attended with retraction of the heel, the division of the inferior portion of the soleal muscle, on the ground, not only that the procedure is free from danger, but that it admits of the more rapid rectification of the deformity. The operation, which he has performed a number of times, is, however, applicable only where there is marked tension of the soleal with relaxation of the gastrocnemial muscle.

The tendon of the *posterior tibial muscle* is cut most conveniently about an inch and a quarter above the inner ankle, the patient lying on his side, with the inner surface of the leg looking upwards. The operation is conducted upon the same principles as in dividing the tendo Achillis, and the only precaution necessary is to avoid the posterior tibial artery and nerve, which might be endangered by carrying the knife too deeply. The tendon of the long flexor muscle may be severed at the same point. In the slighter cases of distortion, the tendon of the posterior tibial muscle may be cut below the ankle, in its passage to the scaphoid bone, but in the more aggravated forms such a procedure is impracticable on account of the concealed situation of the cord. The tendon of the flexor muscle of the great toe may be divided in the sole of the foot, where, when it interferes with the rectification of the limb, it will be found to form a tense, prominent cord.

The most favorable situation for dividing the tendon of the *anterior tibial muscle* is in front of the ankle-joint, where it may usually be readily felt, forming a tense cord, lying somewhat nearer to the internal malleolus than in the natural state. The patient rests on his back during the operation, and care is taken not to wound the anterior tibial artery.

The tendons of the *peroneal muscles* are most easily divided a short distance above the outer ankle, as they run over the fibula. The operation will be facilitated if, as the knife is carried outwards towards the surface, the foot is rotated downwards and inwards, the cords being thus rendered more tense.

Section of the *plantar aponeurosis* is effected upon the same principles as that of the tendons, the knife being inserted flatwise beneath the skin, and made to cut from before backwards, the patient lying upon his back, and the foot being put on the stretch. As the aponeurosis is extremely dense and firm, its division generally requires a very sharp, well-tempered knife, worked with a kind of sawing motion, the finger resting the while on the skin immediately over it, to prevent it from cutting through. It is seldom necessary to divide more than two bands, one in the posterior part of the sole, and the other at the inner margin of the foot, corresponding with the metatarsal bone of the great toe.

As soon as all the faulty structures have been thoroughly divided, the foot is well flexed and extended, in order to break up any morbid adhesions that may exist, and separate as widely as possible the ends of the tendons, as much force being used for this purpose as may seem to be compatible with the safety of the limb. The advantage gained in this way is generally very great, and it is remarkable how tolerant the parts are of manipulation. The little puncture made in the operation is covered with a strip of adhesive plaster, and usually closes by the next morning. The limb, bandaged from the toes up, is immediately placed in an appropriate apparatus. This plan has been constantly pursued by me for many years, and I have never had any cause to regret it; on the contrary, I believe it to be decidedly preferable to waiting three or four days, as usually recommended by authors; for at the end of this time the parts are often so tender as to be quite intolerant of pressure and extension. It is only in cases of an extraordinary character that this rule should be deviated from. There need be no apprehension of a want of reunion of the ends of the divided tendon when this course is adopted. I have myself never seen such an example, nor heard of one that was entitled to credence. The apparatus must, of course, be applied rather loosely at first, and be gradually tightened as the limb becomes more tolerant of its presence. It should be taken off regularly every other day, in order that the limb may be freely washed and rubbed with some mild sorbefacient lotion, as well as subjected to passive motion; a circumstance of great importance in respect to the welfare of the ankle-joint, and the restoration of the muscles of the limb. For the first five or six days after the operation, the limb is kept at rest in an elevated position; after that time the patient may be carried about or walk with the aid of a crutch or stick, as may be found most convenient. The apparatus must be worn day and night, for a period varying from three to twelve months, according to the severity of the case. If the treatment is properly conducted, the patient and surgeon carefully co-operating, there will seldom be any necessity for a redivision of the tendons.

In simple equinus, occurring in childhood and young persons, I have never found it necessary to apply any apparatus, the heel rapidly coming down under exercise, which the patient may safely begin within a few days after the operation.

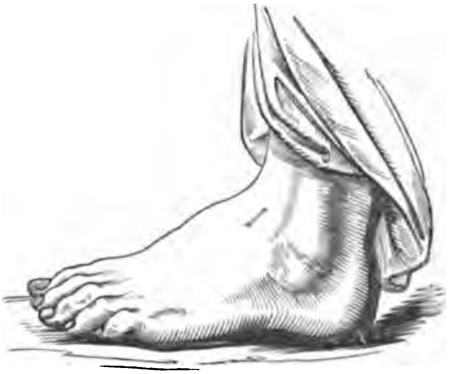
The interval between the ends of the divided tendons is gradually filled up with plastic matter, while the blood poured out in the operation is rapidly removed by the absorbents. As in other subcutaneous procedures, the plasma soon becomes organized, and is finally converted into a firm, dense substance, analogous to the original structure, which it is destined to replace. Observation shows that it is already quite firm and unyielding by the end of the first fortnight; a circumstance which proves how important it is to give due heed to the management of the extending apparatus.

The operation for club-foot is occasionally attended with the puncture of some of the arteries, especially the anterior and posterior tibial. Should such an accident unfortunately occur, the proper plan is to cut the vessel completely across, and to apply graduated compression over the wound.

Finally, whatever mode of treatment may be adopted, it is of paramount importance that it should be carried out under the personal superintendence of the surgeon; to delegate this office to the parent or nurse or to the patient himself, is only a waste of time, and what no sensible practitioner should ever do. I never, in fact, like to intrust the management of a case of club-foot even to an intelligent physician, for there are so many points to demand attention that, unless the greatest possible care is exercised, something will be sure to go wrong, and mar the beauty of the cure.

The adjoining sketch, fig. 731, illustrates the effects of the division of the tendo Achillis and plantar aponeurosis, in a case of equino-varus, attended with bad deformity. The cure was perfect.

Fig. 731.



Effect of the operation for club-foot.

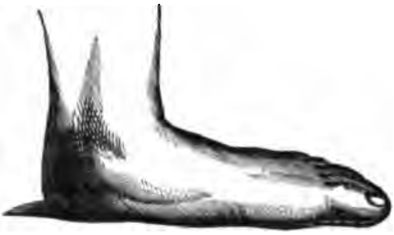
The operation for club-foot, as stated in a previous chapter, was first satisfactorily performed in 1831, by Dr. Stromeyer. The tendo Achillis, however, was divided as early as 1784, by Lorenz, a surgeon at Frankfort, at the suggestion of Dr. Thilenius. The case was one of equino-varus, in a young lady who had suffered from birth. The operation was not performed subcutaneously, but by direct incision. The heel descended two inches; and, although the cure was tedious, the patient finally obtained a good use of the limb. A similar operation was performed not long afterwards by Sartorius; he made his incisions still larger than Lorenz, and it is, therefore, not surprising that he should have signally failed. Michaelis, at a somewhat later period, modified the procedure by dividing the shortened tendon partially, and immediately bringing down the foot by mechanical appliances. His first operation was performed in 1809. In 1816, Delpech, of Montpellier, whose name is indelibly associated with this department of surgery, conceived the idea of performing the operation subcutaneously, and he accordingly carried it into effect in a case of varus conjoined with retraction of the heel. What is remarkable, however, and what greatly marred the success of the result, was that he should have made, as a preliminary step, an incision an inch in length through the skin and deep-seated structures on each side of the tendo Achillis, evidently with the view of facilitating the division of the cord from behind forward. After much trouble and not a little suffering the patient ultimately made a tolerably good recovery, but Delpech was so much discouraged that he never ventured to repeat the operation. Such was the state of tenotomy when Stromeyer, fifteen years later, entered the field, and, perceiving the errors of his predecessors, laid down the proper principles which should guide the surgeon in the execution of his task.

FLAT-FOOT.

This deformity which is most common in young adolescents, occurs in both sexes and in all classes, usually from some inherent congenital defect in the structures of the foot, aggravated by overwork, by the use of imperfectly constructed shoes, or by vicious eversion of the foot, in attempts at polite walking. It is often associated with disorder of the general health, and is most frequently met with in persons of a strumous predisposition, with a tendency to rachitis. Although it sometimes begins very early in life, it seldom becomes a source of deformity until after the age of fourteen. Both feet commonly suffer simultaneously, but not in the same degree.

The affection, as seen in the annexed sketch, fig. 732, essentially consists in a loss of the arch of the foot, so that, when the individual stands up, the sole rests flat upon the ground, instead of upon the heel and the ball of the toes. The external malleolus is uncommonly prominent, the foot inclines outwards, as in the milder forms of valgus, and the ankle is remarkably large and full. In the worst forms of the affection, there is partial displacement of the scaphoid, astragalus, and internal cuneiform bones, the convexity of the dorsum is lost, the toes are everted, and the foot is considerably elongated. The ankle-joint, at all times weak, eventually loses its mobility, and the patient is permanently crippled and deformed, progression being difficult, awkward, and painful. The internal lateral ligament is attenuated and relaxed, while the peroneal, tibial, and extensor muscles are shortened, and not unfrequently affected with the fatty degeneration.

Fig. 732.



Flat-foot.

The *treatment*, in the earlier stages of the complaint, consists in the use of the cold douche, followed by friction with some stimulating liniment, and aided by mechanical support of the ankle, as a shoe or boot with side pieces and a screw for inverting the foot. The sole should be considerably thicker on the inner than on the outer side. The general health is amended, if necessary, by tonics and change of air. Absolute rest of the limb is sometimes of paramount importance, in order to afford the weakened structures an opportunity of becoming invigorated, exercise being taken, in the mean time, in a carriage or swing.

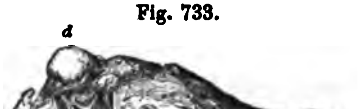
In the more serious forms of flattening, attended with great eversion and more or less elevation of the toes, recourse must be had to tenotomy, with the subsequent employment of a rectifying apparatus. The treatment, in fact, must be very similar to that of valgus. The muscles whose tendons require division are the peroneal, the anterior tibial, and the long extensors of the toes.

PODELKOMA.

A peculiar ulcerous affection of the foot, known under the name of podelkoma, first bestowed upon it, I believe, by Professor Miller, of Edinburgh, is occasionally met with. Its precise nature is not well understood, some regarding it as of a scrofulous, others as of a syphilitic, character. It occurs in both sexes and in different classes, and is most frequent in persons of middle life, of a broken-down constitution.

Commencing usually about the toes, the disease is characterized by the occurrence of numerous small sores, separated by thickened and indurated skin, their edges being steep and abrupt, and their surface incrusted with aplastic lymph. Their shape is generally oval or circular; sometimes, though rarely, several run together, or are connected merely by narrow, undermined bridges of integument. The discharge is foul, fetid, sanious, and irritating. The pain is usually very severe, and there is always serious constitutional involvement, the patient being thin, wan, weak, and fretful. In cases of long standing, the disease is not limited to the soft parts, but affects the other structures also. The nails ulcerate and drop off; the phalanges of the toes are rendered carious; and the calcaneum and metatarsal bones ultimately experience a similar fate. The frightful changes which this disease is capable of producing in the foot are well illustrated in the annexed cut, fig. 733.

Fig. 733.



Podelkoma: *a*, the toes much altered; *b*, the outer side of the foot, in some parts showing cicatrices; *c*, the line of amputation, at the ankle; *d*, the astragalus. The swelling is often much greater than here represented.

In the *treatment* of this disease great advantage may be derived from a regular and persistent course of iodide of potassium along with iodide of iron and bichloride of mercury. Quinine and brandy will be required if much debility exist. The best topical remedies are emollient cataplasms or warm water-dressing, with the free use of the chlorides to allay fetor and promote cicatrization. The nitric acid lotion will also prove useful; and many cases will do well under the application of calomel, or calomel and tannin, with dry lint. In the worst forms nothing short of amputation will answer.

PODODYNIA.

This disease, hitherto undescribed, although not peculiar to tailors, is so common among them that it might very properly be called after their name. It is most frequent among cutters, in consequence, apparently, of their being compelled to maintain for many successive hours every day the erect posture, after they have been accustomed to sit for years upon the board. The feet, being thus suddenly exposed to great hardship, are unable to bear the continual pressure imposed upon them by the weight of the body, and the consequence is that they become exceedingly tender and painful, if not, in time, entirely disabled. The soreness is generally most severe in the sole of the foot, over the calcaneum and the ball of the great toe, or in the line of the metatarso-phalangeal joints, parts which are particularly subject to pressure during the erect posture. The hollow of the foot, however, occasionally participates in the suffering. The pain and tenderness are deep-seated, and are always aggravated by the pressure of the finger, and by walking and standing, which the patient is often obliged to forego in consequence. Little swelling attends the disease, and there is seldom any marked discoloration of the skin. Both feet often suffer simultaneously. The general health is seldom materially, if, indeed, at all, affected.

What the pathology of pododynia is, I have not been able to determine, as no opportunity has been afforded me of dissecting the parts. The probability is that it is a form of inflammation, situated chiefly in the periosteum, or the periosteum and plantar aponeurosis, attended with an inordinate determination of blood and a slight tendency to effusion. In the cases which have fallen under my observation, it has not been in my power to trace any connection between this disease and gout or rheumatism. The subjects are, for the most part, young men.

The *treatment* which I have found most reliable in pododynia has been a succession of blisters, with rest and elevation of the foot, and some attention to the diet and bowels. Medicated lotions, tincture of iodine, and leeching, have exerted no special influence upon the progress of the disease. In a few cases I have tried, but without any material benefit, subcutaneous scarification of the affected parts.

TUMORS.

Various kinds of morbid growths, benign and malignant, are liable to occur in the foot, both upon its dorsal and plantar surfaces. Of the former, the most common are the fibrous and fatty; of the latter, the encephaloid and scirrhus.

The *fibrous* tumor is most frequent on the posterior part of the sole of the foot, where it often sadly interferes with progression; it is generally situated just beneath the skin, imparts a firm, slightly elastic sensation to the finger, is of a rounded, elongated shape, tardy in its growth, more or less vascular, and prone to return after extirpation. The history of the case, and a careful examination of the tumor, will usually reveal its true character.

The *fatty* tumor of the foot is uncommon; it is free from pain, of slow progress, lobulated, and of a doughy, inelastic consistence. The skin is usually sound. I have heard of a tumor of this kind in the foot, of the size of a large fist, for which the leg was amputated.

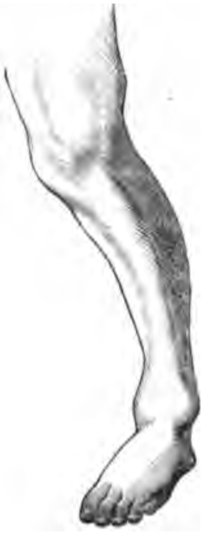
Malignant tumors of the foot pursue the same course as similar growths in other parts of the body. Their diagnosis is generally easily determined by their history. The only remedy is early and thorough excision.

2. AFFECTIONS OF THE LEG.

BOWED LEG.

This affection, familiarly known as the "bowed" or "bandied" leg, consists in an excurvation of the tibia and fibula, attended with a peculiarly arched appearance of the limb, as exhibited in fig. 734, and a singularly awkward gait of the individual. It occurs in various degrees, from the slightest deviation from the normal standard to the most unseemly deformity. The tibia generally suffers more than the fibula, though the latter is seldom entirely free from the defect. The curve is usually lateral, the bone being concave internally, and more or less convex externally. In the worst forms of the affection, there is also an anterior curvature, or the curvature may exist exclusively in front.

Fig. 734.



Bowed leg, in a high degree.

Both limbs are commonly affected, though not always in an equal degree. The deformity is sometimes associated with malformation of the thigh-bones, spinal curvature, and a stunted condition of the whole body, especially when it is the result of rachitis. It is also not uncommon to meet with serious malformation of the knees, ankles, and feet, the latter of which are often greatly turned out.

The immediate cause of bowed leg is softening of the osseous tissue, from defect of earthy matter. This may depend either upon rachitis or upon some other vice of the constitution, the precise nature of which cannot always be determined. The exciting circumstances are two, contraction of the muscles pulling the affected bones out of shape, and the weight of the body compelling them to bend under the superimposed pressure. In rachitis the curvature is frequently attended with actual shortening; the latter defect, however, often exists without the former, the pieces in which it is most marked being perfectly straight.

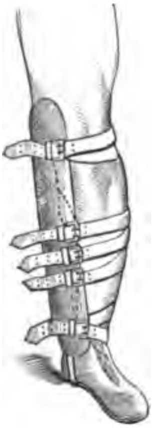
The *treatment* must be early and decided. If it be postponed until the completion of the ossific process, it will be in vain to hope for relief. The general health, if at fault, must be amended by appropriate remedies; walking and standing must be interdicted; and the limbs must be supported by suitable apparatus, applied in such a manner as to make efficient counter-pressure opposite the seat of the excurvation. The more simple forms of the lateral variety will generally yield to a light well-padded wooden splint, fig. 735, stretched along the inside of the leg and inserted by a tubular socket into the heel of a laced boot. It should extend from the malleolus to the upper part of the condyle of the femur, and be fastened by means of strong webbing, long enough to pass twice round the limb and splint, and secured with straps and buckles. The object of this arrangement is to exert the greatest amount of pressure upon the line of curvature. In the more severe grades of the affection, nothing will be found to be more efficient than the apparatus delineated in the annexed cut, fig. 736.

For the relief of the anterior curvature, the best apparatus with which I am acquainted is that of Mr. H. H. Bigg, of London, represented in fig. 737. It simply consists of two stout uprights inserted into the side of a boot and attached above to a metal band fitted to the posterior surface of the leg and fastened by means of straps round the head of the tibia. The requisite degree of pressure is made with two leather bands secured to the vertical pieces, and laced in front.

In the antero-lateral or double curvature the apparatus must be so constructed as to bear simultaneously against the front and side of the limb.

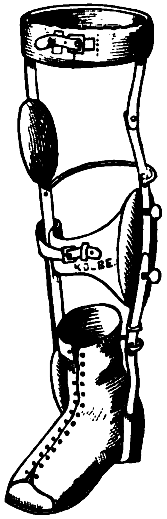
Whatever contrivance be used, care must be taken to watch its effects, otherwise it may, by its pressure, cause severe pain and even ulceration. It should, if possible, be worn day and night. The limbs should be well washed once in the twenty-four hours, and then bathed with a strong solution of alum.

Fig. 735.



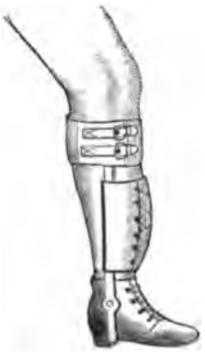
Bigg's apparatus for lateral curvature of the leg.

Fig. 736.



Kolbe's apparatus for bowed leg.

Fig. 737.



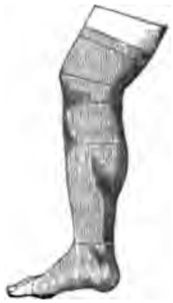
Apparatus for anterior curvature of the leg.

Tenotomy is of no use in these malformations. In the few cases in which it has been practised, it did not seem to have been even of any material temporary benefit.

VARIX.

Varix of the lower extremity is a very common disease in both sexes, and often entails much suffering. In general it involves both the leg and foot, while not unfrequently it extends even into the thigh, being particularly conspicuous along the course of the saphenous vein and its branches. An excellent illustration of this affection will be found in fig. 288, in the chapter on the diseases and injuries of the veins, to which the reader is referred for a full account of it.

Fig. 738.



Laced stocking.

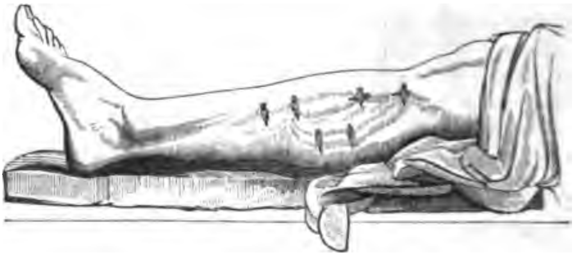
The *treatment* is palliative and radical. In the milder cases, very little is generally required beyond attention to cleanliness of the parts, the avoidance of all constriction of the limb, and the exhibition, now and then, of a purgative, especially in pregnant females. If the patient is very plethoric, much benefit will be experienced from an occasional bleeding. The limb should be frequently washed with cold water, or sponged with some alcoholic lotion, and kept as much as possible at rest in an elevated posture. With the aid of these measures, and the use of a laced stocking, fig. 738, or a well-applied bandage, the milder cases will generally be sufficiently manageable.

For the radical cure, various remedies have been suggested, the safest, as well as the most effectual, of which are the caustic issue, subcutaneous ligation, and injections of the persulphate of iron. Excision and direct exposure of the diseased vessels are dangerous, and should never be practised.

The treatment by the *caustic issue* has been eminently successful in my hands, and I, therefore, give it a decided preference. It consists in making a number of eschars with equal parts of caustic potassa and quicklime, converted into a consistent paste with alcohol. Of this, a portion of the size and [illegible] three-cent piece, only much thicker, is placed directly upon the [illegible] tortuous vessel, at intervals of three, four, or five inches, and allowed [illegible] on for fifteen minutes, by which time the skin and cellular tissue [illegible] thoroughly destroyed. The paste is now removed, and the part, car[illegible] with vinegar, to neutralize any of the alkali that may still adhere [illegible] is covered with an emollient poultice, for the purpose of promoting [illegible] separation of the eschar, and, secondly, the development of granulati[illegible] cure is usually somewhat tedious on account of the length of time [illegible] heal the issues, but it possesses the great advantage of being entire[illegible] danger and always perfectly successful.

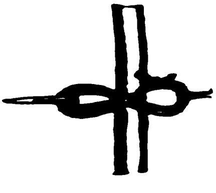
Ligation of the diseased vessels may be performed by passing [illegible] them, at different points, long, ordinary suture pins, and drawing tig[illegible] each of them a stout, well-waxed thread, so as to arrest at once the [illegible] both within the veins and also in their tunics, as delineated in fig. [illegible] surgeons interpose a piece of wax bougie between the skin and ligature [illegible] fig. 740, but I do not believe that this adds anything either to the com[illegible] patient or to the success of the operation. Great care must be taken that [illegible] are carried fairly behind the vein, for, if they transfix it, very serious [illegible] may arise, whereas, if the procedure be properly ex[illegible] it will generally prove harmless, although, as [illegible] served, less so than the operation by caustic. T[illegible] should not be removed until considerable ulcera[illegible] taken place, which will rarely be before the end of the [illegible] or eighth day.

Fig. 739.



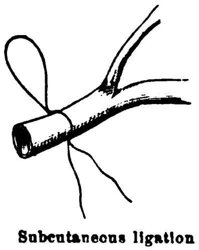
Obliteration of varicose veins by ligation.

Fig. 740.



Twisted suture.

Fig. 741.



Subcutaneous ligation of a varicose vein with silver wire.

Instead of using pins, a much better and safer plan i[illegible] ligate the enlarged vessels *subcutaneously* by mea[illegible] metallic wire, fig. 741, as practised by Dr. R. J. L[illegible] The operation is performed with a straight needle, fr[illegible] and a half to three inches in length, with a sharp, [illegible] point which perforates without cutting. The instrum[illegible] carried across the tissues with the same precautions as [illegible] the ordinary method, and in such a manner as to bri[illegible] at the same orifices both ends of the thread, which are then firmly [illegible] together, and cut off about half an inch from the surface. Spontaneous [illegible] of the sutures will generally occur in from two to three weeks, especially [illegible] are occasionally tightened.

Dr. Levis informs me that he has performed this operation successfully [illegible] thirty-eight instances, without any accident or unfavorable result, his first [illegible] having occurred in 1859. Dr. Bozeman effects subcutaneous ligation [illegible] enlarged vessels with his button suture.

A cure of this disease has occasionally been effected by the injection [illegible] enlarged vein with a solution of the perchloride of iron, as recommended [illegible] Pravaz. The most suitable instrument for the purpose is the one depicted [illegible] fig. 262, in the chapter on aneurism; the vessel is firmly compressed, as a preliminary step, by means of the finger, or a pad and roller, and a few drops, generally not more than three or four, of the solution are slowly thrown into its cavity, the contents of which are immediately coagulated. The great objection to this mode of treatment is that, while it is not always successful, in consequence of the gradual absorption of the clots, it is occasionally followed by serious accidents, as violent erysipelas and even pyemia.

In an article on the treatment of varices by perchloride of iron, published in 1862, by Dr. Louis Sentex, of Bordeaux, 103 cases, collected from various sources, are given. Of these cases 79 were cured, 19 were ameliorated, 6 were unsuccessful, and 1 perished.

A solution of the *persulphate of iron* has lately been employed in this affection with a similar view as the perchloride, but whether it possesses any advantages over it is questionable. Dr. James M. Minor, of Brooklyn, in 1860 published the results of five cases of varix successfully treated by this means, without any ill consequences. The solution was prepared with one part of the salt to four of water, and the blood was usually firmly coagulated in less than a minute.

Whatever mode of treatment may be adopted, the case should receive every possible attention until all danger of erysipelas, phlebitis, and pyemia is passed. The limb, invested with a roller, is placed in an easy, elevated position, and is kept constantly wet with water-dressing, simple or medicated, the diet and bowels being at the same time thoroughly regulated. Premature exercise must be avoided, and the leg must for a long time be supported with a bandage or laced stocking.

When a varicose vein of the leg gives way by ulceration, serious, if not fatal, hemorrhage may be the result, the blood, perhaps, gushing out in a frightful torrent. The proper treatment is to clap the finger on the sore, remove the garter, elevate the heel, and place the patient on his back. Equable pressure with a compress and roller will also promptly arrest the bleeding.

ANEURISMAL VARIX.

This rare form of disease is occasionally observed in the leg or leg and foot. The most remarkable example of the kind I have ever seen, in any part of the body, came under my observation in 1858, in a woman, aged forty-three years, an in-patient of the clinic of the Jefferson Medical College. The varicose enlargement extended from the base of the toes as high up as the knee, affecting both the superficial and deep vessels. Pulsation was perceptible both to sight and touch, and a well-marked aneurismal thrill, most distinct over the posterior tibial region, was readily detected by auscultation. The internal saphenous vein was enormously distended in various parts of its course, being in some places nearly an inch in diameter, and the circumference of the limb was much greater than that of the sound one. The foot had a soft, spongy feel, and a deep, excavated ulcer, of the size of a ten cent piece, with a foul bottom and everted edges, existed upon its dorsal surface. The toes were distorted and enlarged, and near the instep a congenital nevus was found.

As the limb had been for years the constant seat of severe pain, and as the poor woman had long ceased to be able to walk without crutches, I amputated the leg a short distance below the knee. A large number of arteries and also the internal saphenous vein required ligation, the latter vessel being greatly enlarged, patulous, and unable to retract. The case went on tolerably well for eighteen days, when erysipelas and pyemia ensued, followed by an enormous abscess, extending from the stump to the crest of the ilium. The woman expired, completely exhausted, at the end of the fourth week.

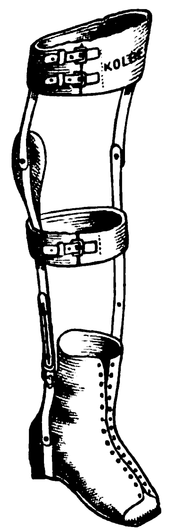
A full report of this interesting case, with an account of the dissection of the body and limb, from the pen of Dr. S. W. Gross, may be found in the Transactions of the Pathological Society of Philadelphia for 1861.

worse, produces a limping, awkward gait, which greatly interferes with progression.

Knock-knee is always a non-congenital affection, though it is occasionally noticed at so early a period of life as to have led to the opinion, at one time sufficiently common, but now obsolete, that it is now and then an intra-uterine lesion. It occurs chiefly in weakly, delicate subjects from the age of two years to that of eighteen or twenty. Children of a scrofulous habit and a rachitic predisposition are particularly obnoxious to it. So far as my experience enables me to judge, I am inclined to believe that the affection is considerably more frequent in males than in females, although some allowance must certainly be made for the fact that the difference in the clothing of the two sexes renders the former, when laboring under knock-knee, a subject of much greater attraction than the latter, many of whom, simply in consequence of the difference in the dress, entirely escape detection both in the house and in the street. The worst cases of this affection that have ever come under my observation occurred in negroes.

The immediate *cause* of this deformity is a relaxed and enfeebled state of the internal lateral ligament, which allows the external hamstring muscle, one of the flexors of the thigh, to drag the head of the tibia gradually outwards, away from the inner condyle. Whether the internal hamstring muscles, the semi-membranous and the semi-tendinous, as they are termed, are originally involved in this partial displacement is not easily determined; but, however this may be, it is certain that they too become very soon relaxed and elongated, thus losing their antagonistic influence, and permitting their fellow on the opposite side to fall into a shortened and contracted condition, which, if not timeously remedied, only tends to a still further increase of deformity. The existence of this state of the parts has been verified by dissection, and may be readily ascertained by carefully examining a person laboring under knock-knee, in the recumbent posture. The limb being turned in various directions, an opportunity is afforded of determining where the structures at and around the knee are most relaxed and most resistant. In the more aggravated forms of the affection, the crucial ligaments always participate in these changes in the natural relations of the parts; the bones of the leg are liable to be curved and otherwise altered, and the feet are either very much flattened, or more or less inverted, as in valgus. In such cases, the ankle-joint also usually becomes involved, the internal ligaments being attenuated and stretched, and the peroneal muscles more or less contracted.

Fig. 745.



Apparatus for knock-knee.

The *treatment* of knock-knee, in its more simple forms, admits of relief by mechanical means, such as a long, hollow, and well-padded splint, applied along the inner surface of the thigh and leg, so as to counteract effectually the contraction of the outer hamstring muscle, which is the active agent in the displacement. Or, instead of such a contrivance, the surgeon may employ the more elegant and efficient apparatus, sketched in fig. 745. The mechanical support should be assisted by a course of tonics, the shower-bath, and the cold douche, followed by stimulating lotions to the affected limb. In short, no pains should be spared to invigorate the general health, and to impart tone to the nervous system, which are so frequently at fault under such circumstances. The apparatus must be worn for a long time, inasmuch as the tendency to relapse is, in almost every case of the kind, remarkably great.

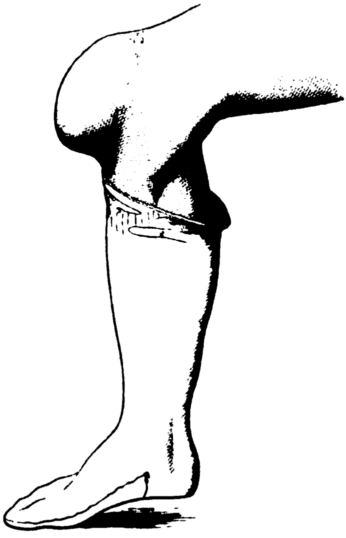
When the affection is obstinate, or exists in a high degree, the best plan is at once to divide the tendon of the two-headed flexor muscle; a procedure which is not only very simple, but extremely valuable in furthering the cure. In performing the operation, the patient is placed upon his abdomen, when, the limb being slightly flexed, a delicate tenotome is entered flatwise at the outer margin of the tendon, from an inch to an inch and a half above the knee, and passed on until it reaches the opposite side, when, the cutting edge being directed forwards, the division is easily effected in the usual manner. No vessel is in danger of being injured, but the peroneal nerve is occasionally cut, followed by slight paralysis, which, however, seldom lasts longer than a few months. Should the femoral aponeurosis be involved in the contraction, any hard and resisting bands that may present themselves may now be severed by a cautious use of the knife. The little punctures made in the operation being covered with bits of adhesive plaster, the limb is wrapped in a bandage, from the toes up, and placed in an easy posture over a pillow; or, what I prefer, the extending apparatus may be applied at once, as the resulting inflammation is generally so slight as not to require any special attention.

An affection the reverse of the preceding sometimes occurs, either in association with it or by itself. In the latter case, one knee is inverted, the other everted. The causes and treatment are the same in both disorders.

HOUSEMAID'S KNEE.

An enlargement of the burse over the patella occasionally takes place, constituting an inconvenient and unsightly tumor, interfering with comfort and progression. It is most common in servant girls and persons who habitually exert much pressure upon this part, and is popularly known as the housemaid's knee. The immediate cause of the affection is inflammation, usually chronic, but now and then acute. The swelling is soft and fluctuating, semi-globular in shape, and unaccompanied by discoloration of the skin and enlargement of the subcutaneous veins. Some degree of soreness is usually present, but seldom any decided pain. The appearances of the parts are well shown in fig. 746, from one of my clinical cases.

Fig. 746.



Housemaid's knee.

The *treatment* of this disease consists in evacuating the contents of the sac, and injecting it immediately after with a small quantity of equal parts of tincture of iodine and alcohol, the fluid being well pushed about, and permitted to remain until it is productive of some pain. Or, instead of this, a small seton may be inserted. Excision must be avoided, as it would be likely to cause serious trouble. The after-treatment consists of perfect repose of the parts and the ordinary antiphlogistic measures.

VENOUS TUMOR.

A venous tumor sometimes occurs in front of the femoro-tibial articulation, closely resembling, at first sight, the housemaid's knee. In a case under my charge not long ago, in a man twenty-five years old, the tumor, situated directly over the patella, and about the size of an ordinary orange, was of a soft, spongy consistence, of a bluish color, free from pain, and partially effaceable under pressure. It was evidently congenital, as it was noticed soon after birth, and was composed of a mass of hypertrophied and varicose veins, a number of which were visible in the skin. There was some enlargement of the neighboring veins, but in other respects the limb was perfectly sound. The proper remedy for such an affection would be subcutaneous ligation.

4. AFFECTIONS OF THE HAM.

A large *synovial burse* sometimes forms in the popliteal region, in connection with one of the tendons of the hamstring muscles, giving rise to a swelling which eventually seriously impedes the movements of the knee-joint. The tumor is characterized by the tardiness of its progress, by a sense of fluctuation, or peculiar puffiness, by an absence of pain, and by a freedom from discoloration of the skin. If any doubt exists as to its real nature, recourse is had to the exploring needle. The treatment is by seton or injection with iodine. No judicious surgeon excises such a tumor. In several instances in which the operation was practised, violent erysipelas ensued, necessitating amputation of the thigh.

A *bloody tumor* occasionally arises in the ham, generally as a result of external violence, as a blow or fall, eventuating in a rupture of some of the smaller vessels in the connective tissue. It is tardy in its growth, semi-elastic, and productive, when of large bulk, of pain and stiffness of the joint. It is distinguishable from aneurism by the absence of pulsation and thrill, and by the history of the case. A section of the tumor reveals the existence of organized coagula, differing in consistence and color, some being hard and pale, others soft, almost semifluid and dark. The inclosing cyst is composed of condensed cellular tissue. The proper remedy is excision.

Solid tumors of various kinds, as the fibrous, fatty, and encephaloid, are also liable to occur here, but they do not exhibit any peculiarities requiring special notice. Their progress and consistence generally afford sufficient evidence of their true character. The encephaloid growth, especially when of rapid formation, is very liable to be mistaken for aneurism, particularly when it receives the pulsation of the popliteal artery. A number of cases have been reported, in which, in consequence of such error, the femoral artery was ligated.

Abscess of the ham is occasionally met with; generally as a result of injury, or of the extension of disease from the knee. The matter is commonly very deep-seated, and, therefore, slow in reaching the surface; the symptoms, both local and general, are unusually severe, and the fluctuation, especially in the earlier stages of the affection, is always very indistinct. The limb soon becomes stiff, the swelling is extensive, and the existence of pus is eventually indicated by an œdematous and erysipelatous state of the skin. The absence of pulsation will usually distinguish it from popliteal aneurism. Still, the surgeon must be upon his guard, not neglecting, in case of doubt, the use of the exploring needle. The proper treatment is a free and early puncture.

General Diagnosis.—Too much caution cannot be exercised in regard to the diagnosis of tumors of the popliteal region. Aneurism is of frequent occurrence here, and it should be recollected that many of its morbid growths, especially if they contain fluid, are extremely liable to pulsate, simply from their proximity to the popliteal artery. On the other hand, an aneurism, even when of large size, may exist, and yet, owing to the solidification of its contents, possess none of the ordinary signs of that disease. Numerous cases have been recorded in which an aneurism of the ham was opened under the belief that it was an abscess; where the popliteal artery was tied on the supposition that the affection was an aneurism, when it was merely an ordinary tumor; or, finally, where the thigh was amputated, the operator imagining that he had to deal with an encephaloid growth, when the dissection showed that it was nothing but a consolidated and partially cured aneurism. Desault, Pelletan, and Dupuytren were all so unfortunate as to open a popliteal aneurism, believing it was an abscess, and two instances of a similar kind have occurred in this city.

The only way to avoid such errors is to proceed with the greatest possible caution; examining the parts again and again, until we are perfectly satisfied concerning the true nature of the disease. As a general rule, the leg should be rigidly extended, when, if the case be one of abscess or cystic tumor, the swelling will usually be rendered more prominent, at the same time that it will be completely divested of pulsation, whereas, if it be aneurismal, the pulsation will be little, if at all, affected. In ordinary growths, there is always an absence of thrill and bellows sound; in aneurism, on the contrary, these symptoms are generally more or less conspicuous. In all cases of doubt, recourse should be had to the exploring needle.

5. AFFECTIONS OF THE THIGH.

The thigh is sometimes drawn remarkably inwards, in a very awkward and constrained position, by the permanent contraction of the short *adductor and pectineal muscles.* A number of cases of this kind have fallen under my observation, chiefly in young boys from five to eight years of age, without my having been able to trace the affection to any assignable cause, none of the subjects having suffered from rheumatism. The contraction sometimes exists simultaneously on both sides, and, under such circumstances, the person usually walks with great difficulty, the gait being very unseemly and crippled, the limbs during progression tending to cross each other. The remedy consists in dividing the faulty muscles freely by subcutaneous section, care being taken to keep the tenotome as closely as possible to the affected structures. The thighs should be forcibly abducted immediately after the operation, and in three or four days the patient may be permitted to run about. The cure will be expedited by exercise on the hobby-horse, and by whatever has a tendency to keep the limbs apart.

The thigh is occasionally rigidly flexed upon the pelvis by the contraction of the *straight muscle*, or of this muscle and the femoral. Such an occurrence may be the result of rheumatism, of accident, or of disease of the hip-joint, and is often readily relieved by very simple measures, as sorbefacient and anodyne liniments, the hot and cold douches, shampooing, and gradual extension of the limb. When the contraction, however, is of long standing, the only reliable remedy is the subcutaneous division of the affected muscles, an operation which is generally sufficiently simple, as it does not involve any large vessels.

The thigh, in consequence of injury or disease, occasionally stands off in a very constrained and unseemly manner from its fellow, owing chiefly, if not solely, to the inordinate contraction of the *tensor muscle*, which forms a hard, firm cord at the upper and outer part of the limb. The femoral aponeurosis often participates in the lesion, and, in that event, requires to be divided along with the tensor muscle.

In hip-joint disease, whether the result of rheumatism, accident, or tuberculosis, the attempts at rectifying the deformity of the thigh are frequently very seriously counteracted by the contraction of the *adductor and flexor muscles*, the division of which is absolutely necessary, as a preliminary measure, to success.

Among the more serious effects growing out of this faulty condition of the muscles of the thigh is permanent anchylosis of the hip-joint, the danger of which is generally in proportion to the duration of the contraction, and the consequent inactivity of the limb. It is, therefore, an object of great importance that early and efficient measures should be adopted for the relief of the parts, before the articulation has been deprived of its normal structure.

Abscesses of the thigh, often of enormous bulk, are liable to occur; they may be phlegmonous or strumous, superficial or deep, and are generally attended with great pain, swelling, and constitutional disturbance. The strumous form of the disease is most common in young subjects, from the third to the tenth year. When the matter is deep-seated, it is always slow in reaching the surface, and its approach is generally denoted by an œdematous condition of the skin with a slight erysipelatous blush. A chronic abscess of the thigh, firmly bound down by aponeuroses and muscles, and attended with imperfect fluctuation, might be mistaken for an encephaloid tumor.

The treatment should be by free and early evacuation of the pent-up fluid, with thorough approximation of the sides of the abscess by compress and bandage, to favor obliteration of its cavity.

Caries of the *great trochanter* sometimes takes place; it is most common in young strumous children, and is liable to be mistaken for coxalgia. The prominent symptoms are, pain and swelling at the outer and upper par[illegible] more or less lameness, elevation of the buttock, and consti[illegible] An abscess gradually forms, and, if the matter is not speedily eva[illegible] burrow extensively among the surrounding structures, causing [illegible] trochanter, and partial destruction of the capsular ligament of the [illegible] diagnosis is readily determined by a thorough examination. The [illegible] is removed with the pliers, gouge, and chisel.

6. AFFECTIONS OF THE NATES.

The gluteal region is liable to various affections, as wounds, ab[illegible]rism, and tumors.

Wounds of the nates require no special notice, as their treatment [illegible] quite simple. Unless they are very deep, or complicated with [illegible] gluteal or ischiatic artery, fracture of the innominate bones, or [illegible] pelvic viscera, they usually heal very kindly under simple dressings [illegible] and recumbency. In the event of serious hemorrhage, the bleeding [illegible] at once be searched for, and effectually ligated at both extremities, [illegible] if necessary, facilitated by freely enlarging the original opening.

Abscesses, phlegmonous and chronic, occasionally form here, and [illegible] seated, may not only cause excessive suffering, but great embarrass[illegible] to their diagnosis. In general, however, the history of the case, a [illegible] nation of the parts, and the use of the exploring needle, will d[illegible] upon the subject, and lead to the adoption of the proper treat[illegible] abscess be not soon opened, its contents may burrow extensively a[illegible] neighboring structures. La Motte relates an instance in which th[illegible] abscess of the buttock travelled down the limb as far as the ank[illegible] have also occurred where it found an outlet through the rectum.

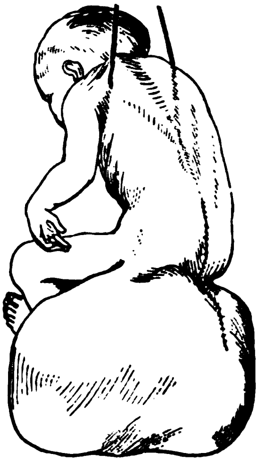
Aneurism of the gluteal and ischiatic arteries is extremely [illegible] is always, or nearly always, the consequence of external injury, as a [illegible] gunshot, or incised wound. The prominent symptoms are abnorma[illegible] and a peculiar whizzing, blowing, or bellows' sound, easily detected [illegible] The remedy consists in exposing the sac, and ligating the artery above [illegible] The operation, the method of performing which is described in the [illegible] aneurism, is generally a very bloody one, and demands great skill for [illegible] ful execution.

Of the various *tumors* that are liable to occur in this region the m[illegible] are the encephaloid, enchondromatous, fibrous, fatty, and encysted [illegible] which is sometimes congenital. In their progress, these morbid gr[illegible] all extend into the pelvic cavity, or, originating there, they may [illegible] out at the sacro-sciatic notch, and thus place themselves under cover of [illegible] muscles. Their diagnosis is generally attended with great embarrass[illegible] hence, if the surgeon is not fully upon his guard, very serious erro[illegible] committed.

The *congenital encysted tumor* often acquires such a size as to inter[illegible]rially with the delivery of the child. Its shape is usually somewhat [illegible] ovoidal, its attachment being effected by a pretty broad base, extend[illegible] among the muscles but not into the pelvic cavity. It is soft and [illegible] fluctuates distinctly under pressure. Its contents are serous, turbid [illegible] or sanguinolent, and readily coagulable by heat, alcohol, and acids. T[illegible] not materially discolored, though, in general, it is a few shades darker [illegible] in its neighborhood. The inner surface of the tumor is usually [illegible] polished, and pervaded by minute, tortuous vessels with tender, frail [illegible] In some cases the tumor is unilocular, in others, multilocular; and [illegible] occasionally occur in which a considerable amount of solid matter ent[illegible] composition.

A good idea of the situation and shape of the encysted tumor of the [illegible] region may be formed by a reference to fig. 747, from a drawing of a [illegible] formerly in the possession of Dr. Keller, who has given an account of it in the Transactions of the Pathological Society of Philadelphia. The tumor, attached to the nates, immediately behind the anus, was nearly of the size of a man's head, and, on being punctured, on the eighth day after the child's birth, it was found to contain upwards of a quart of brownish fluid. Death occurred a few hours after the operation from hemorrhage into the sac, the parietes of which were very dense, vascular, and studded internally with small, transparent cysts, filled with serum. There was no communication between the sac and the spinal canal, or the sac and pelvic vicera.

Fig. 747.



Congenital cyst of the nates.

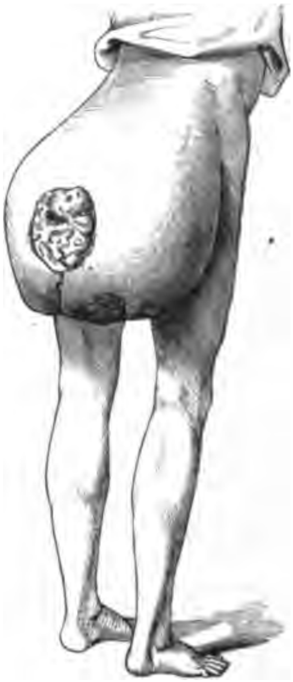
In another case, of a similar character, Dr. Keller was obliged to puncture the tumor before delivery could be effected, the quantity of fluid drawn off being about a gallon. It was also of a brownish color. The child died six hours after its birth from capillary hemorrhage into the sac, the inner surface of which was covered, in parts of its extent, by a soft tissue, exhibiting, under the microscope, a rich network of vessels, very similar to the villi of the intestine. The sac had its root between the anus and the extremity of the coccyx, somewhat to the right of the middle line, without any communication with the vertebral canal.

A tumor, evidently the result of monstrosity by inclusion, or of the presence of a blighted ovum, is occasionally found in this region, closely adherent to the sacrum or to this bone and the coccyx. It consists, for the most part, of a mass of fat, either alone or mixed with rudimentary bones, teeth, and even hair. Sometimes it contains a portion of intestine; and, in an instance observed by Dr. Richardson, a growth of this kind had an appendix attached to it, bearing a very perfect resemblance to a finger, surmounted by a well-developed nail. Dr. Spencer, of Watertown, New York, has communicated to me the particulars of a case in which the tumor was connected with the spinal cord. When the growth is merely a blighted ovum, life may be prolonged for many years.

Should the child be born alive with a cystic tumor, the best plan would be to wait a few weeks, and then draw off a part of its contents, the operation being repeated every six or eight days in the hope of gradual shrinkage and ultimate obliteration of its cavity. In the event of failure, the injection of iodine might be tried, or, instead of this, the sac might be detached with the knife, particularly if it had a narrow pedicle. When the tumor is solid, and there is room to believe that it does not include a portion of bowel, the proper method, of course, would be excision or removal with the écraseur.

A species of *elephantiasis*, consisting in hypertrophy and fibro-plastic degeneration of the areolar tissue, is sometimes met with upon the buttocks. In a remarkable case of this kind, under my charge at the clinic of the Jefferson College, in 1861, in a lad twelve years and a half old, the tumor, as seen in fig. 748, formed an enormous mass hanging off both buttocks down upon the upper part of the thighs, greatly impeding pro-

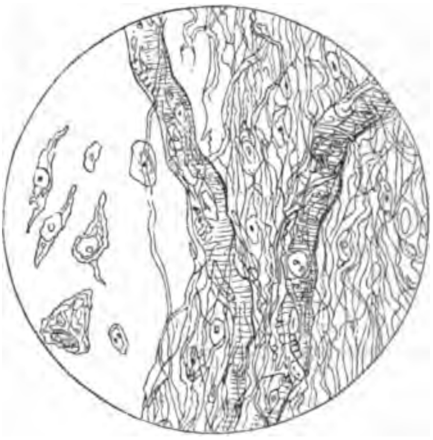
Fig. 748.



Fibro-cystic tumor of the nates.

gression, and causing much annoyance both by its weight, its peculiar position, and its unseemliness. It was nearly thirty inches in circumference, rounded at the extremity, and of a hard, firm consistence. Upon the surface of the tumor were two large ulcers, the seat of a copious discharge of thin, yellowish, fetid pus. The anus was dragged at least three inches beyond its natural situation, and exhibited a very irregular nodulated appearance; the perineum was hard and tumid, the scrotum was enlarged, and the penis was of extraordinary dimensions. The tumor, at its upper part, had a soft, fluctuating feel, as if the tissues around had been infiltrated with serum, as was, in fact, the case; for a very large quantity of this fluid was suddenly discharged at one of the ulcers soon after the lad fell into my hands, followed by great subsidence of the swelling.

Fig 749.



Microscopic characters of a fibro-cystic tumor of the nates.

As the general health was progressively declining, the removal of the tumor was promptly decided upon. An elliptical incision being made, so as to include the ulcerated surface, the flaps were gradually raised, but such was the intimate adhesion between the skin and the substance of the morbid growth that it was impossible to make a clean dissection. The only place where satisfactory separation could be effected was at the upper part of the tumor previously alluded to as having been the seat of serous infiltration. Here the boundary line was well marked. The attachments were also very firm to the gluteal muscles, the fibres of which were very pale, and intimately intermingled with the abnormal structures. Several small serous cysts were opened during the operation, which was, in other respects, unattended with anything remarkable. Some large veins were noticed, but they did not bleed much, and only a few small arteries required ligation. The lad, under chloroform, bore the operation well, and made a good recovery.

The tumor, after removal, was found to weigh eight pounds, exclusive of the fluid lost during the operation. It was of a whitish color, and of dense, firm consistence, grating under the knife. Its microscopic characters, fig. 749, as ascertained by Dr. Packard, afforded a beautiful illustration of the fibrous structure, all the cells being nucleated, and most of them having more than one nucleolus.

The *synovial burse*, naturally existing upon the tuberosity of the ischium, is liable, from constant pressure and other causes, to chronic enlargement, attended with more or less pain and inconvenience, especially in sitting and riding. The tumor varies in size from a hickory nut to that of a small orange, is deep-seated, immovable, and of a globular or ovoidal shape. In its earlier stages, it imparts a peculiar vermicular sensation to the thumb and fingers, but as it increases in size it becomes soft, and distinctly fluctuates. The structures around are generally a good deal tender and indurated. When doubt exists respecting the diagnosis, the exploring needle must be used.

The *treatment* consists in evacuating the contents of the cyst, and then painting the skin twice a day with tincture of iodine. If the case be obstinate a small eschar may be formed upon the most prominent part of the tumor with Vienna paste; or, what is preferable, the cyst may be thoroughly divided with a delicate tenotome inserted subcutaneously. Temporary relief may be afforded with a hollow pad. Excision is not to be thought of, as it might prove dangerous.

7. AFFECTIONS OF THE GROIN.

The principal affections of the groin, requiring notice here, are wounds, inflammation, abscesses, and tumors.

Wounds of the inguinal region, whether incised, punctured, lacerated, or gunshot, may be limited to the superficial structures, or they may extend deeply among the glands and muscles, in the latter event, perhaps, dividing important vessels and nerves, and thus leading to frightful, if not fatal, hemorrhage, and other bad consequences. In general, the treatment is sufficiently simple, but, in order to effect a rapid cure, it is absolutely necessary that the patient should observe strict recumbency with the thigh slightly flexed upon the pelvis, as this affords the best opportunity for the maintenance of accurate apposition of the edges of the wound. All motion of the limb must be avoided.

Any bleeding vessels are, of course, at once secured, and, if the iliac or femoral artery is divided, it must be tied both above and below the wound, which should, if necessary, be freely enlarged to afford ready access to the parts. In most cases, such an injury will prove fatal before the surgeon can reach his patient. Mortification of the toes and feet is apt to follow the division of the principal artery and vein of the limb, especially if some of the anastomotic branches are involved in the mischief.

Inflammation of the groin may be common or specific; more generally the latter, the exciting cause being the syphilitic poison. The disease, in either event, may be limited to the skin and areolar tissue, or it may be located principally in the lymphatic ganglions, either above or below Poupart's ligament. Syphilitic bubo nearly always occupies the former situation, whereas the swelling of the lymphatic ganglions, consequent upon the irritation of gonorrhœa and injury of the lower extremity, generally occupies the latter, and seldom proceeds to suppuration.

In whatever manner the inflammation may have been induced, the object should be to prevent suppuration, by perfect quietude of the part, and by the application of leeches, saturnine lotions, and tincture of iodine, aided by the usual constitutional remedies. If matter forms, an early and free incision, made in the direction of Poupart's ligament, is indicated. The resulting sore should be managed upon general principles, the cure being greatly expedited by laying open sinuses and enjoining recumbency.

Abscesses of the groin sometimes form in consequence of irritation in the cæcum and sigmoid flexure of the colon, the matter passing down towards Poupart's ligament, or, perhaps, even beyond it. Such collections, to which the term stercoraceous may very properly be applied, not only contain fecal matter, but also, at times, ingesta, bits of bones, cherry-stones, and even gall-stones, the impaction of which in the bowel is often the starting-point of the disease. However this may be, the damage inflicted upon the parts is generally so great as to lead to the establishment of irremediable sinuses and fistules.

Chronic abscesses occasionally occur here, and are always readily distinguishable by their history and progress. Great care should be taken not to confound such collections with those attendant upon psoas abscess, which, as is well known, often points in the groin, generally above, but sometimes below, Poupart's ligament, forming, in the latter event, a tumor of variable size and shape, at the upper and inner part of the thigh.

A troublesome form of *eczema* is sometimes met with in the groin, chiefly in young fat children and elderly women, with a pendulous abdomen. The skin is chafed, red, inflamed, and the seat of a thin, watery discharge, attended with distressing itching. An occasional purge, the avoidance of stimulating food and drink, strict attention to cleanliness, and the use of Turner's cerate, or of very dilute ointment of the nitrate of mercury, are generally the most effectual remedies.

Hypertrophy of the lymphatic ganglions of the groin, the result of tuberculosis or ordinary inflammation, is liable to occur, the enlarged structures forming a hard, irregular tumor, situated partly above and partly below Poupart's ligament, without any disposition, in many cases, either to advance or recede, owing, apparently, to some disorder of the general health or some local irritation. An occasional purgative and a mild course of alteratives, with the repeated application of tincture of iodine, blisters, and compression, will, in general, procure the gradual removal of the disease.

Of *tumors* of the groin the most common are the fatty, encysted, and fibrous, to which may be added the enlargements produced by hydrocele of the spermatic cord, varicosity of the saphenous vein, and the undescended testicle. Scirrhus, encephaloid, and melanosis are also occasionally observed, sometimes as primary, but more frequently as secondary, affections.

The *fatty tumor* is not always developed in the groin, but occasionally extends into it from the abdomen, by a sort of migratory process. It may acquire a very considerable volume, and is generally easily distinguished by its pendulous character, and by its doughy, inelastic feel. When small and deep-seated, however, it might be mistaken for femoral hernia, especially if the patient should be seized with symptoms of intestinal strangulation. The two affections, in fact, might coexist. The removal of such a tumor by the knife is usually easily effected, as it seldom adheres very closely, if, indeed, at all, to the sheath of the femoral vessels.

An *encysted tumor* is sometimes found in the groin, but the occurrence is unusual. It varies in size from the volume of a hen's egg to that of the fist, is of a globular or ovoidal shape, and distinctly fluctuates under the finger. Its contents are generally serous. Desault removed from the groin of a girl a hydatid tumor, for which she had previously been advised to wear a truss, and a similar case occurred to Dr. Monro, the cyst in this instance being situated at the upper and inner part of the thigh, where it might readily have been mistaken for a hernia.

Care should be taken not to mistake for a tumor of this kind the *synovial burse* which exists between the capsule of the hip-joint, the body of the pubic bone, and the tendon of the iliac and psoas muscles, and which is liable, in consequence of inflammation, to considerable increase of bulk. The principal sign of distinction is that the enlarged pouch generally follows the movements of the thigh, whereas the encysted tumor, properly so called, usually remains stationary.

The *fibrous tumor*, which is also very uncommon, is, in general, easily recognized by its tardy progress, its firm consistence, and its close connection with the surrounding structures, processes often extending deeply among the vessels, nerves and muscles. Hence, the extirpation of such a tumor is commonly attended with much difficulty.

A *hydrocele of the spermatic cord* occasionally projects into the groin, forming a tumor of variable size and shape, but usually easily recognized by its softness, elasticity, and fluctuation, by its tardy progress, by the absence of disease of the skin, and by the unimpaired state of the general health. If any doubt exist in regard to the diagnosis of the case, recourse is had to the exploring needle.

A considerable tumor is sometimes formed by the *saphenous vein* at its junction with the great femoral, in consequence of a varicose condition of its tunics. The tumor, which is most frequently met with in old, fat subjects, in connection with similar disease of the leg, is commonly of an oblong shape, soft, and about the size of a large almond. It receives a distinct impulse on coughing, and is readily effaced by pressure upon the upper part of the saphenous vein, but promptly reappears when the pressure is removed.

An undescended *testicle* is sometimes retained in the groin, forming a tumor which, especially if inflamed, might lead to the suspicion of the existence of hernia. The absence, however, of the organ from the scrotum, and the peculiar hardness of the inguinal tumor, together with the sickening sensation caused by compressing it, will always serve to distinguish it from all other affections.

Scirrhus of the groin generally takes its rise in the lymphatic ganglions, for the most part as a secondary affection consequent upon malignant disease of the thigh, penis, testicle, or vulva. As an original malady, its character is seldom detected in time to admit of operative interference, as the lymphatic ganglions in the iliac region usually soon participate in the morbid action, and thus oppose an effectual barrier to the use of the knife.

Encephaloid of the groin is occasionally witnessed. A very remarkable case of the kind fell under my notice in 1859, in a young lady, twenty years of age. It had, apparently, commenced in the lymphatic ganglions, when she was sixteen, and gradually progressed until, several months before she expired, it occupied the entire circumference of the upper part of the thigh and nearly the whole of the corresponding nates, forming an enormous mass, attended with excessive emaciation and great enlargement of the subcutaneous veins, some of which were almost the size of the little finger. A few weeks before dissolution, the tumor gave way at its summit, throwing out a large, bleeding fungus.

In a case of this affection, in a young man, aged eighteen, communicated to me by Dr. D. Holmes, of East Smithfield, Pennsylvania, the tumor measured nearly thirty-seven inches in circumference at its widest part. It was of a soft, brain-like consistence, intermixed with large decomposed clots of blood, and involved the upper third of the femur, the acetabulum, ischium, ilium, and pubes. Death ensued within six months from the commencement of the disease.

Melanosis of the groin generally begins in the superficial lymphatic ganglions, and is commonly, if not invariably, associated with similar disease in other parts of the body. It is easily distinguished, even in its earlier stages, by its black color, its firm consistence, and its tuberiform shape. Death usually occurs at a period varying from six to twelve months, secondary tumors, in the meantime, showing themselves in different parts of the body.

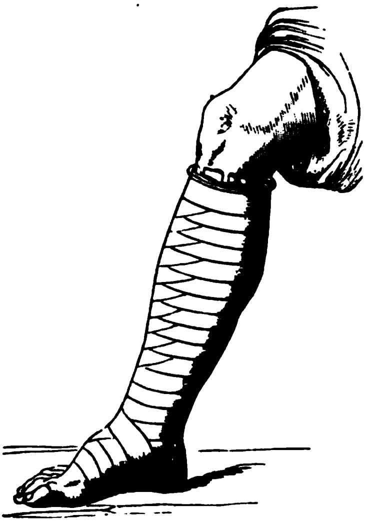
General Diagnosis.—The surgeon, in contemplating the diseases of the groin, will not lose sight of the fact that he has to deal with a region which is often the seat of hernia, both inguinal and femoral, of psoas abscess, and of aneurism, the latter formed either in the course of the femoral artery or in that of the external iliac. He will, therefore, be slow in making out his diagnosis, and be particularly wary in the use of the knife. He will not forget, on the one hand, that a tumor not aneurismal may, if situated over the track of the femoral or iliac artery, readily receive an impulse from the vessel, so as to lead to a false suspicion regarding its true character, nor, on the other, that an aneurism may really exist, and yet be free from pulsation, or, perhaps, be even so soft as to simulate an abscess, especially if it be accompanied with considerable œdema and discoloration of the integuments. The great danger of mistake, however, generally arises, not from tumors, but from hernia, which often coexists with various kinds of swellings of the groin, inflammatory and other, and which, in the event of the supervention of symptoms of intestinal strangulation, might, therefore, occasion great embarrassment, both in regard to the diagnosis of the case, and the proper course of treatment to be adopted for its relief. The opening of an abscess of the groin overlying a knuckle of small intestine, has been followed more than once by an incurable fistule. How cautious, then, should the surgeon be in the use of his knife in a region of such vast importance to health and life!

8. BANDAGES FOR THE INFERIOR EXTREMITY.

The ordinary roller for the *foot* and *leg* is represented in fig. 750. It will be seen that its application begins at the toes, and that it is continued, by circular and reversed turns, as high up as the knee. Its usual length is from five to six yards; its width from two inches and a quarter to two inches and a half. A roller, of similar length and width, will answer for the thigh, the connection being uninterrupted. Care is taken not to make the reverses over the shin, lest they should provoke ulceration. Particular care is also necessary in conducting the bandage across the ankle and knee. In general, compresses will be required to fill up the vacancies between the tendo Achillis and the malleolar processes.

For retaining dressings on the *knee*, as in inflammation and wounds of the joint, an ordinary roller may be used; or, what is more neat and convenient, a

Fig. 750.



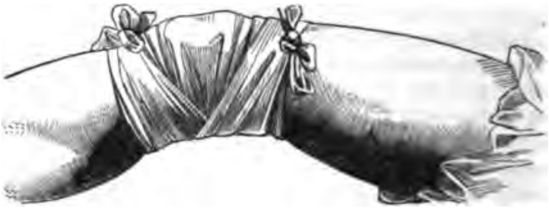
Roller applied to the foot and leg.

piece of muslin, from eight to ten inches in width, and about a yard and a quarter in length, the extremities of which are split to within a short distance of its centre. The centre is then applied to the patella, and the ends, crossed behind the ham, are tied, respectively above and below the knee, as exhibited in fig. 751. In dropsy and loose bodies of this joint, a special contrivance, called a laced knee-cap, described in the first volume, is sometimes employed.

Bandages for the *groin* are rendered necessary in the treatment of various affections, as buboes, abscesses, and wounds, and also after the operation for strangulated hernia and the ligation of the external iliac artery. A very effective contrivance of the kind is a triangular piece of muslin, passed round the thigh, the base being fastened in front, and the apex behind, to a band encircling the abdomen, additional security being given by a side strip, as seen in fig. 752.

Occasionally the bandage, depicted at fig. 753, may be advantageously employed. It consists of an ordinary roller, from six to eight yards in length by

Fig. 751.



Bandage for the knee.

Fig. 752.

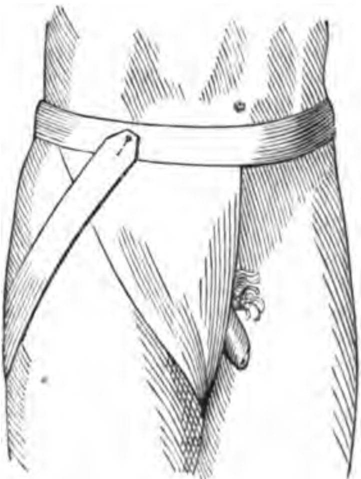
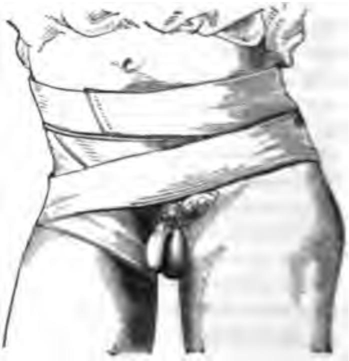


Fig. 753.



Bandages for the groin.

two inches and a half in width, which is carried round the abdomen and the upper part of the thigh, by circular and reversed turns, until the object for which it is applied has been attained. In most cases, it will be best to extend it round both limbs, as it will thus be less likely to slip and become useless. The spica bandage for the groin and thigh is now seldom employed.

CHAPTER XXI.

SPECIAL EXCISIONS OF THE BONES AND JOINTS.

1. TRUNK.

EXCISION OF THE CLAVICLE.

Extirpation of this bone may be required on account of caries, necrosis, morbid growths, and displacement in consequence of disease. Mr. Davie, of Bungay, many years ago, excised the inner extremity of the clavicle in a case of dislocation backwards from deformity of the spine, the luxated head causing such a degree of pressure upon the œsophagus as to endanger life by inanition. Having made an incision from two to three inches in length over the bone, in a line with its axis, and severed its ligamentous connections with the sternum, he divided the bone about one inch from its articular end, by means of a Hey's saw, the soft parts being protected by a piece of sole-leather. The patient speedily recovered, and survived the operation six years. In my private collection is nearly the whole of the left clavicle, which I removed, in 1849, on account of necrosis, from a lad thirteen years old. In 1813, Dr. Charles McCreary, of Kentucky, amputated the right collar-bone at its articulations for scrofulous caries; the patient, a boy aged fourteen, survived the operation many years, enjoying, it is affirmed, excellent use of the corresponding limb. A similar operation was successfully performed in 1852 by Dr. A. J. Wedderburn, of New Orleans, in 1856 by Professor Blackman, of Cincinnati, and in 1860 by Dr. Fuqua, of Richmond. In the latter case, however, the sternal end of the bone was saved.

In 1828, Dr. Mott removed the entire clavicle, on the left side, on account of an osteo-sarcomatous tumor, of great hardness, conical in its shape, and four inches in diameter at its base. The operation was one of immense delicacy and difficulty, requiring nearly four hours for its execution, and more than forty ligatures for the suppression of the hemorrhage. The patient, notwithstanding, made an excellent recovery, and, by means of an apparatus contrived for the purpose, had a perfect use of the arm, being able to move it in all directions. The history of the case, with a detail of the different steps of the operation, may be found at length in the American Journal of the Medical Sciences for 1828, and also in Dr. Mott's edition of Velpeau's Surgery.

The entire clavicle has also been removed, on account of osteo-sarcoma, by Dr. Charles R. S. Curtis, of Chicago. The operation was performed in 1856, but the patient, a woman, aged twenty years, had a return of the disease at the cicatrice at the expiration of two months. A similar, but more formidable, operation was performed by the late Dr. E. S. Cooper, of California.

It is obviously impossible to lay down any definite general rules for the resection of this bone. When its removal is required on account of caries, necrosis, or displacement from disease, the operation is sufficiently simple, a single longitudinal incision, in the axis of the bone, affording ample space for its isolation and detachment. But the case is widely different when the clavicle is buried in a large mass of disease; when the circumjacent structures are [illegible] by morbid deposits; and when not only the [illegible] but likewise the phrenic nerve and the thoracic duct, are [illegible] as in the instance of Dr. Mott. Under such [illegible] one of extraordinary difficulty, demanding the most [illegible] anatomical knowledge for its successful execution. [illegible] with the greatest circumspection, making constant use of [illegible] in close contact with the tumor, tying the arteries [illegible] and guarding against the entrance of air into the veins, [illegible] in the excision of morbid growths [illegible] region. Trustworthy assistants must be at hand, [illegible] may be anticipated.

EXCISION OF THE SCAPULA.

[illegible] of this bone has now been so frequently performed as [illegible] to prove that, when the cases are [illegible] of risk. The cases of Mussey, R[illegible] [illegible] and others, in some of which the entire scapula was [illegible] portion of the clavicle, clearly evince [illegible] dissections of a character [illegible] Mussey's operation was performed in 183[illegible]; [illegible] amputated at the glenoid cavity, had [illegible] scapula and clavicle, both of which were removed in their [illegible] healed almost completely by the first intention [illegible] fifteen years after the operation. [illegible] of Strasbourg took away, with complete success, [illegible] extremity of the clavicle, on account of [illegible] aged 51 years, whose arm had been amputated [illegible] previously. Mr. Fergusson, of London, [illegible] in 1847. The scapula had long been affected [illegible] and the patient, although much exhausted, recovered [illegible] Professor Schuh, of Vienna, removed nearly the entire [illegible] osteo-sarcoma, in a child eight years of age.

[illegible] impossible to lay down any specific rules for the performance [illegible] it would be still more futile to attempt such [illegible] scapula. The truth is, every case must provide its own rules [illegible] in which, in 1850, I removed nearly the whole of [illegible] for an osteo-sarcomatous affection, will serve to convey a [illegible] procedure necessary under such circumstances. It may be [illegible] was a man aged forty years, and that the tumor, first [illegible] was fifteen inches in length by fifteen and a half in [illegible]

The patient being placed recumbent, with the body inclining towards [illegible] an incision sixteen inches in length, was made from the [illegible] to the inferior extremity of the tumor, its direction being [illegible] and inwards. Another, beginning about five inches [illegible] and terminating about the same distance from its [illegible] was then carried in a curvilinear direction, so as to include a small [illegible] The integuments, which were exceedingly dense [illegible] at the superior part of the tumor, were then dissected off [illegible] the morbid growth, first towards the spine, and then [illegible] Having detached the elevator and trapezius muscles, I sawed [illegible] process of the scapula just behind the clavicle, and [illegible] dorsal and anterior serrated muscles. Carrying my fingers underneath the tumor, and raising it up, I severed its connections with [illegible] deltoid and other muscles of the arm, sawed the neck of the [illegible] and [illegible] removed the entire mass with comparatively little difficulty.

Several vessels were divided in the early stage of the operation, at the d middle part of the tumor; but these were easily controlled by the fingers assistants. Several arteries near the neck of the bone bled so freely as to d the ligature after the removal of the l growth. About twenty-four ounces od were lost. The patient became very towards the close of the operation, and ıls were necessary to revive him. The nse wound thus produced was dressed three interrupted sutures and adhesive ›, and supported by a compress and a l body bandage.

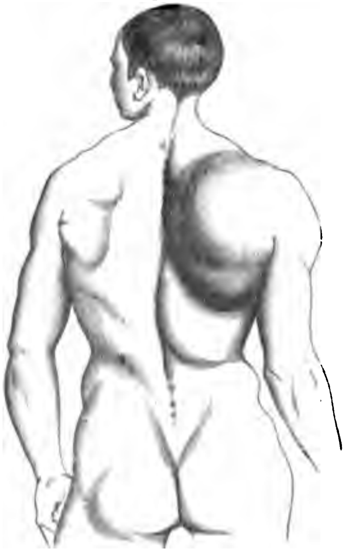


Fig. 754.

Encephaloid of the scapula.

› untoward symptoms occurred after the ation; nearly the whole wound healed by first intention; and, at the end of three ‹s, the patient went home, gradually im- 'ing in health and strength. From expo- to cold, however, he contracted pleuro- umonia, from the effects of which he died ·e months after the operation. The neck glenoid cavity of the scapula were unal- :d, but the remainder of the bone was com- tely disorganized. The tumor weighed up- rds of seven pounds, and belonged to that ss of structures usually, though vaguely, nominated osteo-sarcomatous. The external pearances of the tumor are exhibited in fig. 4.

The entire scapula has occasionally been removed on account of necrosis or ng-standing caries. Such an operation was first performed by Mr. Syme, in 356, and in 1858 it was repeated by Mr. G. M. Jones, the disarticulation in ɔth instances being effected at the shoulder-joint, with removal of the acromial ‹tremity of the clavicle. The patient of the latter recovered with a good use of ıe corresponding limb, but with a decided falling of the shoulder.

I have on two occasions removed nearly the whole of the spine of the scapula or necrosis; and a considerable number of cases have been recorded of excision of the acromion process. The coracoid process has also been extirpated both on ccount of injury and disease.

EXCISION OF THE RIBS.

Caries and necrosis of the ribs, both from disease and accident, are by no means uncommon, and often lead to the necessity of excision. These pieces are also liable to carcinomatous degeneration, and to different morbid growths, which can only be removed by the interposition of the knife and pliers. The annals of surgery afford numerous examples of excision of the ribs, from a portion hardly an inch in length to nearly the entire bone. Operations of this kind were probably performed at a very early period of the profession, and some very extraordinary cases have occasionally been published of their success. Thus, it is reported of Suif that he cut away from a man two of his ribs, making an opening into his chest capable of admitting the fist, and through which he removed, with complete success, a portion of diseased lung. Incredible as this case may at first appear, it has its analogue in one which occurred in the practice of Dr. Milton Antony, of Georgia. In this instance, the fifth and sixth ribs, which were extensively carious, were removed along with two-thirds of the right lobe of the lung, the patient surviving the exploit nearly four months. The particulars of this remarkable case are recorded in the sixth volume of the Philadelphia Journal of the Medical and Physical Sciences. I have repeatedly excised considerable portions both of the ribs and of their cartilages; and at the clinic of the Jefferson Medical College, in 1857, I removed from a negro lad, aged seven-a large mass of disease; when the circumjacent structures are all intimately matted together by morbid deposits; and when not only the great vessels of the neck, but likewise the phrenic nerve and the thoracic duct, are in close proximity to the affected bone, as in the instance of Dr. Mott. Under such circumstances, the operation must be one of extraordinary difficulty, demanding the greatest patience, skill, and anatomical knowledge for its successful execution. The surgeon must proceed with the greatest circumspection, making constant use of the handle of the knife, keeping in close contact with the tumor, tying the arteries as they are divided, and guarding against the entrance of air into the veins, the danger of which is always considerable in the excision of morbid growths from the base of the lower cervical region. Trustworthy assistants must be at hand, and every emergency must be anticipated.

EXCISION OF THE SCAPULA.

Excision of this bone has now been so frequently performed as not only to establish its feasibility, but to prove that, when the cases are properly selected, it is comparatively devoid of risk. The cases of Mussey, Rigaud, Fergusson, Schuh, myself, and others, in some of which the entire scapula was removed along with a considerable portion of the clavicle, clearly evince what the human body is capable of enduring under dissections of a character apparently the most desperate. Dr. Mussey's operation was performed in 1837; the patient, six years after the arm had been amputated at the glenoid cavity, had osteo-sarcoma of the scapula and clavicle, both of which were removed in their whole extent. The enormous wound healed almost completely by the first intention, and the man, when last heard from, fifteen years after the operation, was still well. In 1844, Rigaud, of Strasbourg, took away, with complete success, the entire scapula, with the external extremity of the clavicle, on account of an osseous growth, from a man, aged 51 years, whose arm had been amputated at the shoulder-joint eight months previously. Mr. Fergusson, of London, performed a similar operation in 1847. The scapula had long been affected with caries and necrosis; and the patient, although much exhausted, recovered without a bad symptom. Professor Schuh, of Vienna, removed nearly the entire scapula in 1860, on account of osteo-sarcoma, in a child eight years of age.

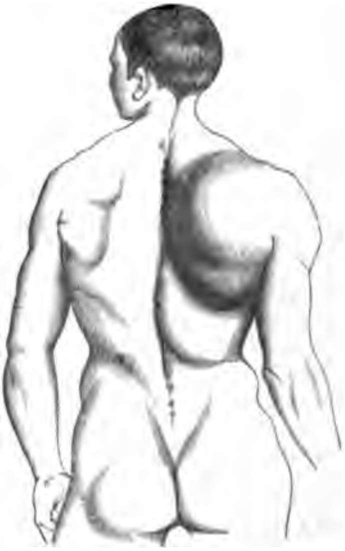
If it be impossible to lay down any specific rules for the performance of excision of the clavicle, it would be still more futile to attempt such an undertaking for the scapula. The truth is, every case must provide its own rules. The following instance, in which, in 1850, I removed nearly the whole of the right scapula for an osteo-sarcomatous affection, will serve to convey a general idea of the procedure necessary under such circumstances. It may be premised that the patient was a man, aged forty years, and that the tumor, first noticed nine years previously, was fifteen inches in length by fifteen and a half in breadth at its widest part.

The patient being placed recumbent, with the body inclining towards the abdomen, an incision, sixteen inches in length, was made from the superior angle of the scapula to the inferior extremity of the tumor, its direction being obliquely downwards and inwards. Another, beginning about five inches below the upper end of the first, and terminating about the same distance from its lower end, was then carried, in a curvilinear direction, so as to include a small oval flap of skin in its centre. The integuments, which were exceedingly dense and thick, especially at the superior part of the tumor, were then dissected off from the surface of the morbid growth, first towards the spine, and then towards the axilla. Having detached the elevator and trapezius muscles, I sawed through the acromion process of the scapula just behind the clavicle, and then divided the broad dorsal and anterior serrated muscles. Carrying my fingers next underneath the tumor, and raising it up, I severed its connections with the ribs, cut the deltoid and other muscles of the arm, sawed the neck of the scapula, and thus removed the entire mass with comparatively little difficulty.

Several vessels were divided in the early stage of the operation, at the posterior and middle part of the tumor; but these were easily controlled by the fingers of the assistants. Several arteries near the neck of the bone bled so freely as to demand the ligature after the removal of the morbid growth. About twenty-four ounces of blood were lost. The patient became very faint towards the close of the operation, and cordials were necessary to revive him. The immense wound thus produced was dressed with three interrupted sutures and adhesive strips, and supported by a compress and a broad body bandage.

No untoward symptoms occurred after the operation; nearly the whole wound healed by the first intention; and, at the end of three weeks, the patient went home, gradually improving in health and strength. From exposure to cold, however, he contracted pleuro-pneumonia, from the effects of which he died three months after the operation. The neck and glenoid cavity of the scapula were unaltered, but the remainder of the bone was completely disorganized. The tumor weighed upwards of seven pounds, and belonged to that class of structures usually, though vaguely, denominated osteo-sarcomatous. The external appearances of the tumor are exhibited in fig. 754.

Fig. 754.



Encephaloid of the scapula.

The entire scapula has occasionally been removed on account of necrosis or long-standing caries. Such an operation was first performed by Mr. Syme, in 1856, and in 1858 it was repeated by Mr. G. M. Jones, the disarticulation in both instances being effected at the shoulder-joint, with removal of the acromial extremity of the clavicle. The patient of the latter recovered with a good use of the corresponding limb, but with a decided falling of the shoulder.

I have on two occasions removed nearly the whole of the spine of the scapula for necrosis; and a considerable number of cases have been recorded of excision of the acromion process. The coracoid process has also been extirpated both on account of injury and disease.

EXCISION OF THE RIBS.

Caries and necrosis of the ribs, both from disease and accident, are by no means uncommon, and often lead to the necessity of excision. These pieces are also liable to carcinomatous degeneration, and to different morbid growths, which can only be removed by the interposition of the knife and pliers. The annals of surgery afford numerous examples of excision of the ribs, from a portion hardly an inch in length to nearly the entire bone. Operations of this kind were probably performed at a very early period of the profession, and some very extraordinary cases have occasionally been published of their success. Thus, it is reported of Suif that he cut away from a man two of his ribs, making an opening into his chest capable of admitting the fist, and through which he removed, with complete success, a portion of diseased lung. Incredible as this case may at first appear, it has its analogue in one which occurred in the practice of Dr. Milton Antony, of Georgia. In this instance, the fifth and sixth ribs, which were extensively carious, were removed along with two-thirds of the right lobe of the lung, the patient surviving the exploit nearly four months. The particulars of this remarkable case are recorded in the sixth volume of the Philadelphia Journal of the Medical and Physical Sciences. I have repeatedly excised considerable portions both of the ribs and of their cartilages; and at the clinic of the Jefferson Medical College, in 1857, I removed from a negro lad, aged seventeen, the central pieces of the sixth and seventh ribs, one of which was upwards of six inches in length, on account of scrofulous disease. During the operation, the apex of the heart could be plainly seen pulsating beneath the denuded structures. The boy rapidly recovered, and has ever since been in good health. Formidable operations upon the ribs, affected with various kinds of tumors, for the most part of a carcinomatous character, have been performed by different American surgeons, among whom it will be sufficient to mention the names of John C. Warren, George McClellan, and William Gibson.

In caries and necrosis of the ribs, excision may be performed with the greatest facility, as the diseased pieces are always more or less isolated by the morbid action, especially from the pleura, which is usually very much thickened and indurated, and, therefore, not at all in danger of being injured, unless great negligence is displayed. The intercostal arteries, too, are generally out of harm's way. In necrosis, a slight incision will commonly suffice to enable the surgeon to effect extraction, but in caries a more extensive incision, made in the axis of the affected bone, will be needed. If the attachments are firm, the knife must be kept close to the bone, and it is safer here, as elsewhere, in similar cases, to use the handle of the instrument than its point. When the ribs are involved in morbid growths, excision will be environed with many difficulties, owing to the fact that the pleura generally retains its normal characters, and that it is then almost impossible to separate it from the affected structures without penetrating its cavity; moreover, such tumors are usually extremely vascular; and are apt to project to a considerable distance beneath the surrounding parts. As it respects the incisions necessary in such cases, the most eligible and convenient will be the T-shaped, semilunar, or elliptical.

EXCISION OF THE STERNUM.

The sternum has occasionally been excised, not wholly, of course, but in part, on account of caries, to which its substance is very subject in scrofulous and syphilitic persons, and also on account of necrosis, gunshot injury, and compound fractures. Its affections are liable to be complicated with abscess in the anterior mediastinum, thickening of the pleura, and lesion of the costal cartilages. The diseased portions may usually be gouged away or extracted without difficulty, exposure having been effected by a T-shaped, or crucial incision. When the bone is largely implicated, without any tendency to spontaneous separation, the removal will be expedited by perforating it with the trephine, to admit the introduction of the elevator. In general, however, its substance is so soft that it may easily be cut away with the pliers, or even a stout, probe-pointed knife.

EXCISION OF THE PELVIC BONES.

The bones of the pelvis are liable to caries and necrosis, often attended with troublesome sinuses, and sometimes requiring extensive operative interference. I have, in one instance, been compelled to remove the tuberosity of the ischium; in another, a large fragment of the iliac crest; and, on one occasion, a considerable piece of the posterior and lateral part of the sacrum. Exostoses sometimes form upon these bones, and may, unless deeply seated under the gluteal muscles, be easily removed with the knife and chisel.

The coccyx may be invaded by caries, from the contact of fecal matter in anal fistule; and a similar effect is occasionally produced by a blow or kick, or by injury inflicted by the pressure of the child's head in protracted parturition. Dr. Nott, of Mobile, as early as 1832, excised this bone on account of severe and intractable neuralgia seated in its substance, its lower extremity being hollowed out into a mere shell. A vertical incision was made behind, along the middle line, when the bone was disarticulated at the second joint, and separated from its muscular and ligamentous attachments. The patient was a female, twenty-five years of age; the wound was long in healing, and a month elapsed before the pains disappeared from their original site. Dr. Nott has since repeated this operation several times, and it has also been performed, with variable success, by Simpson, Godfrey, and others, on account of a similar disease.

2. SUPERIOR EXTREMITY.

EXCISION OF THE BONES OF THE HAND.

Excision of the head of the phalanx of the *thumb* has sometimes been practised in compound dislocations and fractures, and the success attending the operation has afforded a warrant for performing it in case of caries of its substance. The joint is exposed by a free lateral incision, and the offending portion removed with the pliers. The cure will be more likely to be satisfactory if a small piece be clipped off from the contiguous bone, as the two raw surfaces, when brought together, will then unite more readily.

It is never desirable to exsect any of the *digital phalanges*, except the distal one; such a procedure would only leave a useless finger, and could, therefore, never become general. When the last phalanx is rendered carious, or deprived of its vitality, as so often happens in whitlow, the proper plan is to remove it through an incision extended along its palmar aspect; and it is well known that, when the periosteum is not destroyed, the bone, under these circumstances, is sometimes partially regenerated.

Excision of all the *carpal bones* has occasionally been attempted, generally in connection with that of the articulating extremities of the radius and ulna, but I am not aware that it has ever, in a single case, been followed by any satisfactory results. On the contrary, the disease for which the operation was performed has nearly always returned, and eventually led to the necessity of amputation of the forearm. It is questionable, therefore, whether the operation is worthy of repetition. It is different, however, when only a few of the carpal bones are in a carious state; then exsection of the affected pieces should be practised by all means, for if pains be taken to remove all the morbid structure, and no serious injury is inflicted upon the soft parts, particularly the sheaths of the tendons, there will be a very reasonable prospect of a good result, the hand not only preserving its usefulness, but also its symmetry. In several cases in which I adopted this method the effect was most satisfactory. The site of the piece to be removed will usually be indicated by a fistulous opening; if any formal incision is necessary, it should be made upon the dorsal surface of the hand. A gouge and mallet will be indispensable instruments in the operation.

The *metacarpal bones* have frequently been removed in part, or in whole, for caries, necrosis, or external injury. The operation, which is sufficiently simple, consists in making a longitudinal incision along the dorsal aspect of the bone, in separating it from the soft parts by keeping the knife close against its surface, and in disarticulating it in the usual way. The carpal end of the bone, if sound, should be left, and in that case the division should be effected with the pliers. As the object is to preserve the finger, the extensor tendon is carefully drawn aside during the operation. The metacarpal bone of the thumb may be treated in a similar manner, the phalanges being retained; and, although the member may not, for a time, be of any material use, yet as the soft parts become consolidated it will be found to be quite serviceable, to say nothing of the important part which it plays in preserving the symmetry of the hand.

EXCISION OF THE WRIST-JOINT.

Excision of the wrist-joint, originally performed by Mr. Cooper, of England, soon after the middle of the last century, has been practised much less frequently than that of the other articulations, and in the cases in which it has been done the result has not been at all encouraging. The operation, besides being awkward and difficult on account of the importance of the structures concerned in it, and the peculiar conformation of the joint, is extremely liable to be followed by permanent anchylosis of the wrist, and stiffness of the fingers. Another objection is that, when the carpal bones are involved in the disease, there is apt to be a return of the morbid action, eventually necessitating amputation of the forearm. Hence some surgeons prefer amputation in the first instance to the risk, pain, and inconvenience of excision without the certainty of a final cure. In opposition, however, to this decision, it may be urged that a stiff hand with the preservation of the mobility of even some of the fingers is very greatly to be preferred to no hand at all, both on the score of utility and seemliness, and that there are few persons who, if the matter were left to their own choice, would not rather submit to excision, if it afforded any reasonable prospect of success, than to the unconditional loss of so important and valuable a member.

There are two methods according to which this operation may be practised; in one the incisions are made along the inner and outer margins of the limb, in the other over its dorsal aspect, in the form of a semilunar flap, with the convexity downwards. When the disease necessitating the operation is limited to the ulna and radius, the former plan is to be preferred, but the latter, as affording more room, when the carpal bones participate in the disorganization. Whichever procedure be adopted, care is taken not to divide the extensor tendons of the thumb and fingers, as this would compromise their future usefulness, and thus frustrate the main object of the excision. The ends of the radius and ulna are removed on the same level, either with the pliers or with a narrow saw; in the flap operation it may be necessary, during the division of the bones, to protect the soft parts with a spatula or strip of leather.

During the after-treatment, the forearm, bent nearly at a right angle with the arm, is well supported with two light splints, and the thumb and fingers are kept semi-flexed, in order that, when the cure is completed, they may be more easily approximated. Passive motion may be instituted at the end of a month.

The *statistics* of this operation are very limited. Dr. Hodges has furnished a table of 39 cases of excision for disease, of which 17 recovered, the majority of them having a more or less serviceable hand; 6 died, and 8 underwent subsequent amputation. In 8 cases no definite result had been reached. The mortality after amputation of the forearm is only a little over 12 per cent.

EXCISION OF THE BONES OF THE FOREARM.

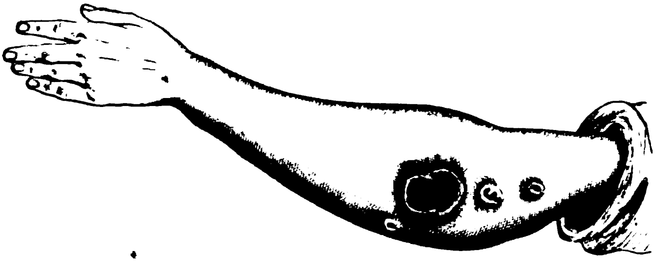
The bones of the forearm may require extirpation in part, or in whole, for caries, gunshot injury, or chronic enlargement. A case of excision of both the radius and ulna occurred, in 1853, in the practice of Dr. Compton, of New Orleans. The operation was performed on account of a compound, comminuted fracture, two months after the accident; both pieces being removed with the exception of the inferior extremity of the radius. The greater portion of the periosteum, which had been detached during the progress of the resulting inflammation, was left in the wound. The patient, a boy, aged fifteen years, made an excellent recovery, having a very good use of the hand. The forearm was three inches shorter than natural, and flexed at a right angle with the humerus.

Dr. Robert B. Butt, of Virginia, exsected, in 1825, the lower two-thirds of the *ulna* of the left side, in a man twenty-five years old, who, several years previously, had received a punctured wound in the wrist-joint, causing violent inflammation of the whole limb as far as the elbow, and ultimately terminating in hypertrophy and caries of the ulna, with immense thickening of the periosteum. Three months after the operation, the man had so far recovered as to be able to pursue his occupation of a house-joiner, flexion, extension, and rotation of the joints being as free and uninterrupted as they had ever been. In 1853, Dr. Carnochan performed a similar operation, taking out the entire ulna, which, as in the case of Dr. Butt, was excessively enlarged from one extremity to the other, measuring, at the base of the coronoid process, five inches and a half in circumference, and weighing nearly eight ounces. His patient, a man, thirty years of age, was of a strumous habit, and the disease was supposed to have been occasioned by a sprain of the arm in splitting wood with a heavy axe. No untoward symptoms occurred during the after-treatment; very little deformity was perceptible when the wound was healed; and the functions of the hand and forearm were preserved in a remarkable degree. Mr. Jones, of Jersey, has also removed the whole ulna; and Dr. George Williamson, in his Notes on the Wounded from the Mutiny in India, refers to a similar case in which, on account of disease, he exsected this bone along with the head and neck of the radius and the lower end of the humerus, the patient regaining an excellent use of his limb.

The entire *radius* was exsected by Dr. Carnochan, in 1854, on account of caries, hypertrophy, and eburnation, caused by a severe blow upon the upper part of the forearm, the patient, a man aged twenty, recovering with such an excellent use of the limb as to be able to write with ease and rapidity. When last seen, six years after the operation, the parts remained perfectly sound, but the hand was not quite in its natural axis, as it inclined a little outwards, while the styloid process of the ulna formed an abnormal prominence on the inside of the wrist. The bone was exsected from joint to joint. An operation of a similar kind, with an equally fortunate result, was performed in 1859 by Professor Choppin, of New Orleans, upon a boy, aged fourteen years. In this case, however, the inferior articular extremity of the bone was retained, as it was found to be free from disease.

During the session of 1857, I excised, at the clinic of the Jefferson Medical College, somewhat more than the upper half of the bone, along with the outer condyle of the humerus, for scrofulous disease of several years' standing, the patient being a young Irishman in dilapidated health. He recovered well from the operation, but of the ultimate result I am unable to give any account, as the case was soon after lost sight of. The appearance of the limb, prior to the operation, is exhibited in fig. 755.

Fig. 755.



Caries of the elbow-joint, as seen before excision.

Mr. Erichsen states that he has resected the whole radius, with the exception of its articular head, which was sound, and that a useful arm was left. Excision of the lower four-fifths of this bone was performed by Professor Carnochan, in 1857. His patient, a woman, aged thirty-one years, made an excellent recovery, the functions of the hand being so little impaired that she was able to perform her household duties nearly as well as before the operation. The bone was greatly diseased and enlarged.

Excision of the entire radius is performed by making a longitudinal incision along the posterior and outer aspect of the forearm, from the wrist to the elbow, and in detaching the bone carefully from its connections, with the precaution of inflicting as little injury as possible upon the surrounding structures. In caries, the bone is occasionally so slightly adherent that the periosteum may readily be peeled off from it by means of the handle of the knife, as happened in my case of partial excision. When the attachment is very firm, the rule is to keep the knife as closely against the bone as possible. Removal of the ulna is effected upon the same principle, but in this case the incision is carried along the posterior and inner aspect of the limb. In neither operation is it necessary to divide any of the principal arteries of the forearm, and hemorrhage from the smaller branches may be moderated by compression of the brachial by the fingers of an assistant. When the entire ulna or radius is removed, the proceeding will be facilitated by giving the wound, at each extremity, a curvilinear direction, or a short transverse cut may be extended from it at these points, either outwards or inwards, according to the nature of the bone concerned.

Excision of the bones of the forearm has occasionally been practised on account of *gunshot injuries;* but, hitherto, with no very encouraging results. The operation was performed in the Schleswig-Holstein wars in seven cases, and, although they all ultimately got well, their recovery is said to have been much slower and less satisfactory than those cases which were left entirely to nature, the splinters being, for the most part, removed as they became detached.

EXCISION OF THE OLECRANON.

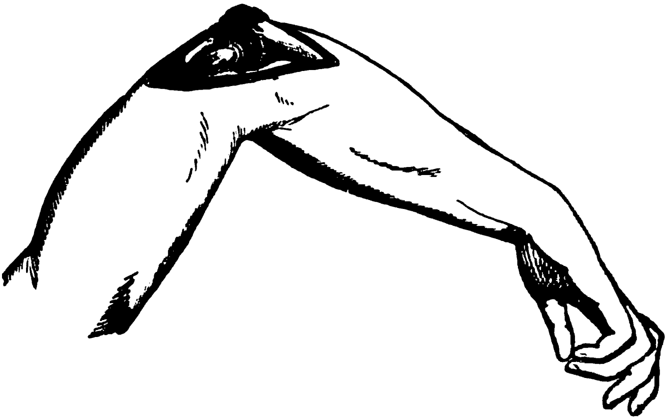
Excision of the olecranon has been practised, in a few instances, for caries, or caries and necrosis. The operation is also occasionally demanded on account of gunshot and other injuries. A T-shaped incision being made over the posterior part of the elbow, the process is detached from the tendon of the extensor muscle, and divided with the pliers or a narrow saw. The wound is accurately approximated by suture, plaster, and collodion, the limb is maintained at rest in the straight position, and, in due time, passive motion is instituted, to preserve the use of the joint.

Dr. Buck, of New York, exsected the olecranon, in 1842, on account of hypertrophy of its substance from external injury, followed by total loss of flexion and extension, although pronation and supination partially remained. The patient recovered from the effects of the operation, but the limb, instead of being benefited, became permanently stiff.

EXCISION OF THE ELBOW-JOINT.

Excision of the elbow-joint has been practised more frequently than that of any other articulation in the body, and such has been the success attending it, that no doubt can any longer be entertained respecting its propriety. The operation was first performed by the elder Moreau, in 1797. In 1828, it was introduced into Great Britain by Mr. Syme, of Edinburgh. It is usually required on account of caries, or caries and necrosis, of the heads of the contiguous bones, and should always be preferred to amputation of the arm, whenever it is possible to preserve a sufficieny of osseous matter to leave a good limb. Experience has proved that the danger of excision of the elbow-joint is, in general, very slight, when the operation is limited to the articular extremities of the bones; when the medullary canal of the humerus is exposed, there is always risk of diffused suppuration and pyemia, and the same is true, although not in so great a degree, of the medullary

Fig. 756.



Excision of the elbow-joint.

canal of the radius and ulna. Besides, the shorter the excised pieces are, the greater, other things being equal, will be the probability of a serviceable limb.

In regard to the mode of operating, surgeons have hitherto failed to agree upon any particular standard, for the reason, doubtless, that no one method is applicable to all cases. Mr. Park, by whom the procedure was originally suggested, although never practised, thought the object might be attained by a single longitudinal incision, along the posterior part of the elbow, and the excision has often been effected in this way. Moreau used an H-like cut, by means of which he obtained two large flaps, which, being reflected in opposite directions, exposed the parts very freely. Some, again, as Erichsen, avail themselves of a ⊢ -shaped incision, as seen in fig. 756; and I am myself an advocate for a semilunar one, the convexity looking downwards, on the ground that the wound made by it is more favorably situated for the escape of the discharges. In partial excision, a simple vertical incision will usually be quite sufficient for the purpose.

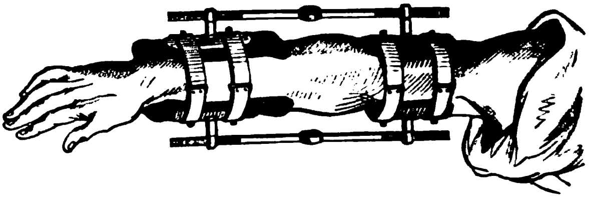
In performing the operation, the patient should incline somewhat towards his abdomen; and the incisions should be sufficiently ample to give the surgeon free room for the accomplishment of his design. An assistant is ready to compress the brachial artery, in the event of there being any likelihood of much hemorrhage, which, however, will rarely be the case, unless the articular vessels, which will necessarily be divided, have become much enlarged from protracted irritation. Care is also taken not to injure the ulnar nerve, as it courses along the inner margin of the olecranon. If the semilunar incision be adopted, the knife should be drawn across the back part of the limb, from the superior extremity of one condyle to that of the other, for a distance of about two inches and a half; the flap being then raised, the ligaments, if still remaining, are cautiously severed, and the tendon of the three-headed extensor muscle detached at its insertion. The instrument is next passed closely round the olecranon, and this process removed with the pliers. The joint being thus fairly exposed, the heads of the radius and ulna are liberated from their connections, and thrust through the wound by forcibly bending the joint and pushing the forearm upwards. The saw is now applied, and the diseased structure excised, care being taken not to interfere, if possible, with the attachment of the two-headed flexor and anterior brachial muscles, as this would seriously compromise the future usefulness of the extremity. The articular end of the humerus is removed in a similar manner. In cutting off the bones the ulnar nerve is drawn to one side with a blunt hook; but it is not necessary to protect the parts in front of them, as the brachial artery lies securely under cover of the anterior brachial muscle.

When the articular ends of the bones of the elbow are only partially affected, the operation should be performed precisely in the same manner as when they are more extensively involved; but such a procedure would not be proper when the disease is confined to one of the bones of the forearm, as the radius, and the outer condyle of the humerus. Under such circumstances, the excision should be limited to the disorganized parts, the sound being left undisturbed, in the hope that they may, at least partially, preserve the functions of the joint. In several cases in which I have adopted this procedure, the result was highly gratifying.

During the *after-treatment* the limb is placed in an easy, flexed position, in a tin case, with an opening opposite the elbow, to facilitate drainage, upon an angular splint, or, what is better than either, upon Heath's apparatus, delineated in fig. 757. By means of this contrivance, which is furnished with screws and a central hinge, the forearm can readily be maintained at any desired length and angle. The ends of the bones should, therefore, be kept in tolerably close proximity with each other; for, as they are destined to unite by fibro-ligamentous tissue, it is important that this substance should be as short as possible. As the cure progresses, the forearm is gradually flexed, until, at length, it is brought to a right angle with the arm, passive motion being frequently practised to prevent permanent anchylosis.

When the after-treatment is judiciously conducted, there is not only usually no danger from the operation to the patient's life, but every reason to hope for a good result as it respects the use of the limb. Many of the persons subjected to this operation were afterwards able to pursue, with great satisfaction, their former occupation. Mr. Cock, of London, in 1857, operated upon a man whose elbow had been excised, eighteen years previously, by the late Mr. Key, on account of scrofulous caries. He had enjoyed, throughout the whole interval, very excellent use of the limb until a short time before his admission, when, in consequence of an attempt to work with it in a new position, disease again appeared, requiring a slight operation, which promised to be followed by further relief. The case affords a beautiful illustration of the triumphs of conservative surgery.

Fig. 757.



Heath's splint, in the excision of the elbow.

Statistics.—Excision of the elbow-joint on account of *gunshot* injuries has lately engaged much attention among military surgeons. Dr. Esmarch, whose work comprises the details of all the cases of this operation that occurred during the Schleswig-Holstein campaigns, states that of 40 upon which it was performed, only 6 died; in one the forearm became gangrenous, and had to be amputated, and in another the treatment was still progressing when last heard from. The remaining 32 cases all recovered perfectly, with a more or less useful limb. In the Crimean war, there were 22 resections of the elbow-joint among the British surgeons, with 5 deaths, of which 2 occurred after secondary amputation. In the Russian army, during the same period, the operation was performed 20 times with 15 recoveries. Thus, of the whole number, 82, 16 died, or 1 in about 5.

The time at which resection is performed in gunshot injuries of the elbow-joint exercises an important influence upon recovery. Thus, of 11 cases in the Schleswig-Holstein campaigns, in which the bones were removed within the first twenty-four hours, only 1 proved fatal; whereas of 20 cases operated upon when the parts were in a high state of inflammation, that is, from the second to the fourth day, 4 died. Of 9 resections performed from the eighth to the thirty-seventh day, only 1 ended fatally. These facts are, practically, of the deepest interest, as showing the bad effects which may be expected from interference after the occurrence of severe inflammation with incipient suppuration.

Of 119 cases of excision of the elbow-joint for *disease*, tabulated by Dr. Hodges, 104 recovered, and 15 died. In 15 cases, subsequent amputation was rendered necessary. Of the 89 cases recovering without amputation, 77 regained useful arms. In 470 amputations of the humerus, 157 proved fatal, or in the ratio of about 33 per cent. It will thus be perceived that the results of these statistics are decidedly in favor of excision of the elbow.

EXCISION OF THE HUMERUS.

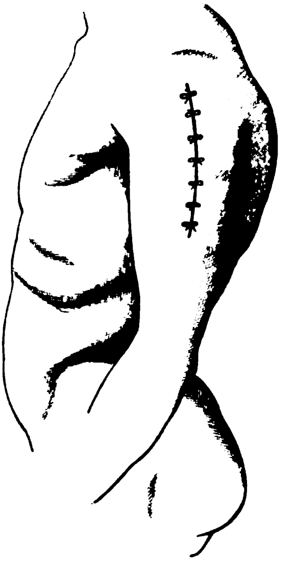
Excision of the shaft of the humerus is sometimes required on account of gunshot injuries, or fractures caused by severe falls, railway accidents, or machinery in rapid motion. Unfortunately, however, we are not in possession of sufficient statistical information to enable us to form a correct opinion respecting the real value of the procedure. In the first two Schleswig-Holstein campaigns, resection of the ends of the fragments was practised for the cure of gunshot lesions in 9 cases, of which 4 died, while of the remaining 5 several had very defective limbs. Subsequently resection was abandoned, the surgeons limiting themselves for the most part to the immediate removal of the splinters, and of 32 cases thus treated only 5 died, the others making excellent recoveries, with useful limbs, although in many the humerus had been terribly shattered by cartridge shot.

EXCISION OF THE SHOULDER-JOINT.

Excision of this articulation is frequently rendered necessary on account of caries and necrosis of the head of the humerus, or of this bone and of the contiguous surface of the scapula. It has also been done, in numerous instances, on account of gunshot injury of the shoulder, attended with laceration of the soft parts and comminution of the upper extremity of the humerus. The operation was first formally performed for caries of the head of the humerus in 1771, by Mr. James Bent, of New Castle, England, although a nearly similar procedure had been executed as early as 1740, by Thomas, of Pezenas, in Languedoc. When proper care is exercised, as it respects the selection of the cases, and the mode of the procedure, I believe that it will seldom be followed by any bad effects, especially in pathological cases, while the patient will usually have a very good use of his limb. Less impairment of function, other things being equal, will necessarily ensue when a small than when a large portion of bone is removed. In an instance in which Lentin excised the entire humerus, except two inches of its lower extremity, the arm remained permanently stiff.

Various methods have been proposed and executed for the removal of the shoulder-joint; thus, some content themselves with a vertical incision, extending from the acromion process down through the belly of the deltoid, nearly as far as the insertion of this muscle; some, again, prefer a V-shaped cut, the base looking upwards; Moreau, who performed the operation a number of times, made a quadrilateral flap with the base below; Morel fancied that the easiest way of accomplishing the object was to make a semilunar flap over the most prominent part of the shoulder, not unlike that made in amputation; finally, Mr. Syme employs two incisions, a perpendicular one through the middle of the deltoid, and an oblique one extending upwards and backwards from the inferior angle of the first. It cannot be denied that some of these methods afford the surgeon most ready access to the joint, and enable him to effect excision of the humerus with the greatest facility; but then they have the disadvantage, and a very serious one it is, of inflicting most severe injury upon the deltoid muscle, in consequence of the oblique and more extensive division of its fibres, and of thus greatly protracting the cure, as well as materially enhancing the danger. It is for these reasons that I have limited myself, in the operations which I have performed upon the scapulo-humeral articulation, to the simple perpendicular incision, as depicted in fig. 758; and I believe this will generally be found to answer every purpose, while it is entirely free from the objections here adverted to. In one of my cases, treated in this manner, I was enabled to remove, without difficulty, upwards of four inches of the humerus, and the recovery was most satisfactory. The operation is generally the more easy because, in caries of the joint, there is nearly always very considerable atrophy of the deltoid muscle and absorption of the subcutaneous adeps. The incision should begin just beneath the acromion process, and, descending nearly in a straight line through the cushion of the shoulder, should termi-

Fig. 758.



Appearance of the wound after excision of the head of the humerus.

nate within a short distance of the inferior attachment of the deltoid. The knife is carried down, at the first stroke, to the bone, which is then thoroughly liberated from its connections with the soft parts by means of a stout, blunt-pointed bistoury, passed closely round its neck, so as to sever the tendons of the subscapular and spinate muscles, the long head of the biceps being left undisturbed. The capsular ligament is generally destroyed by the disease, but if any portion remain, it must be divided in the usual way. If more than the head of the bone requires removal, it will be necessary to separate any fleshy fibres that may be attached to its shaft. This step of the procedure may be greatly facilitated by the use of the instrument exhibited at p. 439, fig. 312. The bone is now pushed through the wound by depressing the elbow backwards, and the whole of the diseased portion sawn off, the soft structures being carefully protected from the teeth of the instrument. If the glenoid cavity is involved in the morbid action, the affected substance is scraped or cut away; the acromion process is dealt with, if need be, in a similar manner. Sometimes it is necessary to remove the head of the humerus and a large portion of the scapula, as in the case which occurred to Mr. Jones, of Jersey. The bleeding vessels being secured, the cavity is next washed out with cold water, the sinuses, if any exist, are properly pared, and the edges of the wound are approximated by suture and bandage, the arm being secured to the side of the body, and the forearm supported in a sling. To favor discharge, a small tent should be inserted into the lower angle of the wound.

Fig. 759.

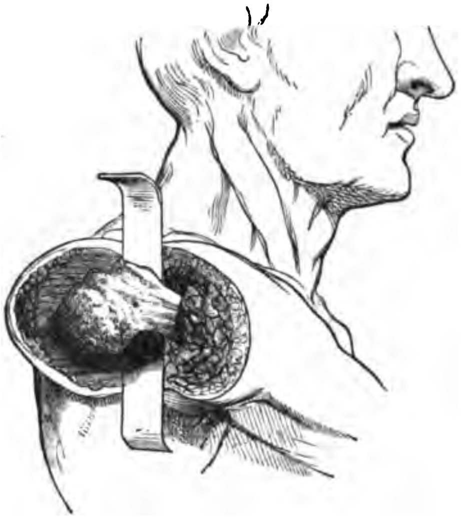
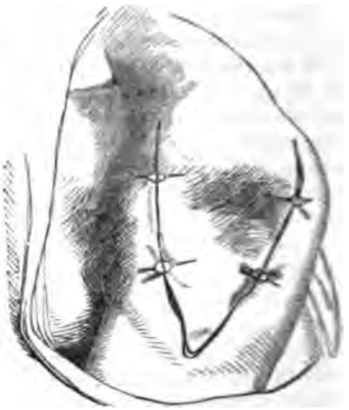


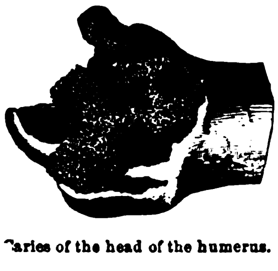
Fig. 760.



Flap operations in excision of the head of the humerus.

The posterior circumflex artery is necessarily divided in this operation, and is frequently the only vessel that requires ligation. The axillary artery, vein, and plexus of nerves are entirely beyond the reach of the knife.

Fig. 761.



Caries of the head of the humerus.

In the flap operation, the incisions may be made so as to represent the shape of a U, as in fig. 759, from Erichsen, or the outline of a V, as in fig. 760. In either case, the deltoid muscle is extensively divided, and easy access afforded to the articulation. The procedure, however, is one of great severity, and must sometimes be followed by grave consequences.

The diseased appearances of the head of the humerus, in one of my cases, are well illustrated in fig. 761. The bone was sawn off upwards of an inch and a half below its tuberosity. The specimen affords conclusive evidence of the impossibility of a cure, under such circumstances, by ordinary measures. The patient was a seafaring man nearly forty years of age, sent to me by Dr. J. L. Pierce, of Bristol, Pennsylvania.

Statistics.—Dr. Hodges has tabulated 96 cases of excision of this joint for *gunshot* injuries, of which 25 or 26 per cent. proved fatal. Of these operations 53 were primary, with 16 deaths, and 34 secondary, with 6 deaths, affording thus a result in favor of the latter in the proportion of 17 to 10. In the Schleswig-Holstein campaigns, the operation was performed 19 times with a loss of 7, most of the deaths having been caused by pyemia. Of 27 cases operated upon by the British surgeons in the Crimea, only 2 died; and of 14 cases resected by Baudens all, except 1, got well. In this country, removal of the shoulder-joint was first practised for a gunshot wound by Dr. William Ingalls, of Boston, in 1813, the patient, a soldier, making a good recovery with a tolerably useful limb.

Of 50 cases, analyzed by Dr. Hodges, in which the shoulder-joint was excised for *disease*, 42 recovered, and 8 were fatal; 2 of the former, however, died at the end of a year of phthisis, and 2 others were not materially benefited. It would thus appear that 16 per cent. of all the cases were fatal, and 24 per cent. unsatisfactory. The patient usually obtains a very good use of his limb, anchylosis being an exceptional occurrence.

3. INFERIOR EXTREMITY.

EXCISION OF THE BONES OF THE FOOT.

The principal articulations of the lower extremity which require to be dealt with in this way are those of the hip, knee, and ankle; excision is occasionally practised upon some of the tarsal and tarso-metatarsal joints, and the procedure not unfrequently results in a good use of the foot. But I am quite sure that such an operation should never be performed upon the metatarso-phalangeal articulations and upon the joints of the toes, for the reason that the anchylosed and abbreviated member could not fail to be sadly in the way of the patient's convenience and comfort when he comes to wear his boot. The rules which apply to excision of the bones of the metacarpus and fingers are altogether irrelevant here on account of the difference in the uses to which these parts are subjected. The hand is essentially a prehensile organ; hence, even if only one finger, although that should be the little one, or the metacarpal portion of the thumb, can be preserved, we shall render the possessor a most valuable service. The foot, on the contrary, is an organ of support, serving to receive and sustain the weight of the body during progression and in the erect posture. The longer and broader, therefore, it is, the better it will be able to perform its important offices. But there is another view of the subject which must not be overlooked in a parallel of this kind; it is this, that, while the hand is perfectly free, the foot is constantly incased in a tight boot or shoe, a circumstance which renders it absolutely essential to the comfort of the patient that the whole limb, but more particularly the toes, should be as free from prominences and cicatrices as possible. It is for these reasons that the toes, when fatally injured or diseased, are never removed at their articulations or in their continuity, but always at their metatarsal junctions; when the operation is practised at these sites, as it occasionally is by young and thoughtless surgeons, the stump is always in the patient's way, and usually requires secondary amputation. Moreover, it is not only important that the foot should be free from painful and inconvenient scars and prominences, but that it should be firm and solid, otherwise it cannot possibly serve the purposes of a basis of support. We may excise a metacarpal bone, and yet, if proper care be taken during the after-treatment, the corresponding finger will retain, not only its symmetry, but also, in a considerable degree, its usefulness. But the result is very different when we remove a metatarsal bone without the toe with which it is articulated; as soon as the support afforded by that bone is gone, the member is unable to sustain itself, and, as a consequence, it constantly drops away from its fellows, to the great discomfort and annoyance of the individual. I believe, then, that excision of the bones and joints of the toes and metatarsus ought, as a general rule, to be superseded by amputation, as altogether more likely to leave a serviceable and symmetrical limb.

Kramer excised the metatarso-phalangeal articulation of the great toe on account of caries as early as 1824, and a similar operation was performed three years subsequently by Roux. The tendency which occasionally arises during the after-treatment in the extensor tendons to pull the end of the toe upwards, may be promptly counteracted by their subcutaneous division, though in general this will not be necessary. Cases of this operation, followed by an excellent use of the great toe, have been reported by Pancoast, Regnoli, Fricke, Butcher, and others.

Examples of the successful excision of the anterior extremity of the first metatarsal bone, in complicated dislocation, are mentioned by Textor, Josse, and others, the first of these surgeons having performed the operation as early as 1822. Blandin, Roux, and Jobert have removed the anterior half of this bone for caries and cystic degeneration; and the posterior extremity of the first phalanx of the great toe has been excised in two instances, with excellent results, by Champion.

The objections that have been urged here against excision of the toes and metatarsus cannot apply to exsection of the bones of the tarsus; the utility of the operation has, in fact, been tested in numerous instances, and, although it is impossible to lay down any specific rules for its performance, yet any surgeon of ordinary skill or anatomical knowledge may undertake it with a reasonable hope of success. The great difficulty of the procedure depends upon the close and intimate manner in which the different pieces of the tarsus are connected together, the thickness of the plantar tissues, and the course and depth of the plantar arteries. This, however, may generally be overcome by attacking the bone to be removed either from the margin of the foot, or from its dorsal surface, where the soft parts are comparatively sparse and unimportant. A useful guide to the diseased bone is commonly afforded by one or more sinuses, the situation of which is nearly always indicated by a red papula of granulations, and more or less discharge of sanious fluid.

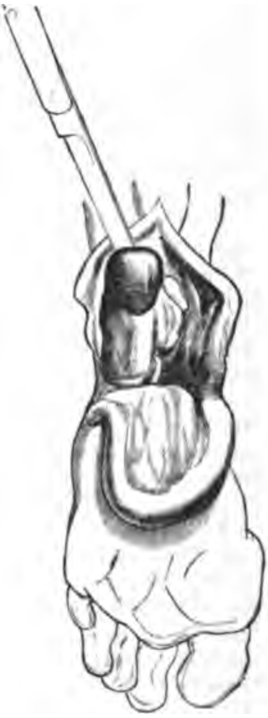
Caries of the foot is the disease for which excision is most commonly required, and experience long ago demonstrated that the tarsal bones are those which are most liable to suffer in this way. Not unfrequently, however, the heads of the metatarsal bones participate in the lesion, and occasionally, again, they are its exclusive seat. It rarely happens, according to my observation, that only one bone, either of the tarsus or metatarsus, is affected; in general, at least two or three pieces are in a carious condition, and cases arise where every one suffers, the foot presenting a horribly swollen and deformed mass, full of sinuses, and the seat of excessive pain. Under such circumstances, of course, nothing short of amputation will afford any chance of relief, and the sooner it is performed the better.

When the caries is limited to the cuneiform bones, to these bones and the heads of some of the metatarsal bones, or, lastly, to the cuneiform bones and the adjoining portions of the cuboid and navicular bones, excision deserves a decided preference over amputation, and I am satisfied that the operation, if properly executed—that is, in a bold and uncompromising manner, the surgeon removing all the diseased structure—will generally be followed by highly satisfactory results. I have repeatedly extirpated nearly the whole of the cuneiform bones, together with the heads of several of the metatarsal, and also considerable portions of the cuboid and navicular, and yet the patient had a most excellent and useful foot, answering all the purposes of the natural limb. Access is easily obtained by a large horseshoe flap, with the convexity downwards, upon the dorsum of the foot, care being taken not to injure the sheaths and tendons of the extensor muscles. The removal of the affected bones, whether in part or in whole, must be effected by the cautious use of the gouge and mallet, aided by strong, narrow, probe-pointed knives, and long-bladed, slender pliers. Several mops must be at hand for sponging out the deep cavities made in the operation; and the bleeding, which, however, is seldom profuse, must be controlled, after the excision is completed, by compression, with or without styptics, according to the exigencies of the case.

The *calcaneum* has been exsected in numerous instances, but for the most part only partially, on account of caries, necrosis, and fracture. Carnochan, Morrogh, and C. R. Greenleaf, have each reported a case of successful excision of the entire bone. I have myself on two occasions removed the whole of the heel portion of the calcaneum for necrosis. When the entire bone requires excision, the best mode of procedure is that recommended by Mr. Erichsen, inasmuch as we are thereby enabled to preserve the integrity of the sole, a circumstance of great consequence to the patient after his recovery from the operation. In most of the methods heretofore practised the incisions are directed to be carried into the plantar region, so that the cicatrices are afterwards subjected to the pressure and friction of the shoe during progression, and therefore rendered liable to pain, induration, and ulceration. In the case reported by Dr. Carnochan, the sole was not entered, but as the proceeding was somewhat more complicated than that suggested by the English surgeon, I feel inclined to accord the latter the preference.

"The patient," says Mr. Erichsen, "lying on his face, a horseshoe incision is carried from a little in front of the calcaneo-cuboid articulation round the heel, along the sides of the foot, to a corresponding point on the opposite side. The elliptic flap thus formed is dissected up, the knife being carried close to the bone, and the whole under-surface of the os calcis thus exposed. A perpendicular incision, about two inches in length, is then made behind the heel, through the tendo Achillis in the mid line and into the horizontal one. The tendon is then detached from its insertion, and the two lateral flaps dissected up, the knife being kept close to the bones from which the soft parts are well cleared, as in fig. 762. The blade is then carried over the upper and posterior part of the os calcis, the articulation opened, the inter-osseous ligaments divided, and then by a few touches with the point, the bone is detached from its connections with the cuboid, which, together with the astragalus, must then be examined, and if any disease is met with, the gouge should be applied. By this operation all injury to the sole is avoided, and the open angle of the wound being the most dependent, a ready outlet is afforded for the discharges."

Fig. 762.



Excision of the calcaneum.

When the parts are thoroughly cicatrized the patient may walk about with the aid of a shoe with a high heel stuffed with horse-hair, but great care must be taken for a long time not to bear too much weight upon it.

Excision of the *astragalus* was first performed by Fabricius Hildanus in 1670. Of 78 cases, analyzed a few years ago, by Dr. Oskar Heyfelder, 5 were partial, and 73 were total, with a mortality of 11. Of the 67 cases that survived, two were afterwards subjected to amputation. The remainder are said to have been fully restored, with the retention of the mobility of the foot, or even the formation of a new joint, in 10. In most of the cases, the operation was performed on account of severe injuries, as gunshot wounds, comminuted fractures, and complicated dislocations, especially the latter.

Flattering as these statistics apparently are, they should be received with a great deal of reserve. In the first place, they are very limited, and, secondly, their results are altogether too favorable. Many fatal cases have doubtless occurred that have never been reported at all, and of the patients that survived the immediate effects of the operation not a few probably suffered afterwards either from a return of disease, as in the case of caries and necrosis, or, as in the case of accident, from destructive inflammation of the neighboring bones, with which the astragalus is so intimately united, and which must necessarily sustain more or less injury during the exsection, however carefully executed. The operation, moreover, is one of extreme difficulty. Considering all these circumstances, it is questionable whether, in the great majority of cases, it would not be better to sacrifice the limb than to attempt to save it. At all events, it would certainly be well, in every instance of this kind, for the surgeon to place himself mentally in the situation of his patient, and to ask whether, if he were the subject of grave injury or disease of the astragalus, he would prefer excision to amputation? If he had all the facts on both sides of the question, on the one hand, the great danger of excision, the violent inflammation which would be sure to follow it, and the probability of a relapse of the disease; and, on the other, the comparative safety of amputation, the freedom from subsequent suffering, and the certainty of an excellent stump, one which might be readily adapted to an artificial limb, he would hardly hesitate as to the course he would pursue. He would unquestionably decide in favor of the removal of the leg above the ankle, or at the joint by Pirogoff's or Syme's method.

When excision of the entire astragalus is performed for caries, limited to its own substance, the best plan will be to expose the ankle-joint at its anterior and outer aspect, by a semilunar flap, with the convexity downwards, taking care not to injure any of the more important soft parts. The bone is separated, first, from its connections with the tibia and fibula, then from those with the calcaneum, and finally from those with the navicular bone. After its lateral attachments have been severed, the disarticulation will be materially facilitated by inclining the foot forcibly backwards, at the same time that an attempt is made with a stout pair of forceps to draw the astragalus out of its bed in the opposite direction. The cutting must be done with a thick, narrow, probe-pointed knife, kept close against the bone in order to avoid the plantar arteries, especially the internal, which would otherwise be in danger. The operation being completed, the calcaneum is brought up into the gap between the two malleolar prominences, where it is carefully maintained by appropriate apparatus, the foot resting at a right angle with the leg. Great attention will be required during the after-treatment to prevent retraction of the heel by the action of the gastrocnemial muscles. Slight motion is occasionally procured between the contiguous surfaces, but, in general, there will be permanent anchylosis. The limb will necessarily be somewhat shortened.

I have in my possession a cast, kindly presented to me by Dr. James H. Hutchinson, of this city, which admirably exhibits the appearances of the foot and ankle after the removal of the entire astragalus. The patient was a boy, eleven years of age, on whom Dr. Peace performed the operation, at the Pennsylvania Hospital, in 1858. He had been hurt about seven months previously, by a fall from a haymow, which was followed by severe inflammation, and soon after by ulceration of the integuments, leaving an opening large enough to admit the little finger. Several small pieces of bone came away before his admission, and the remainder of the mass was afterwards extracted without difficulty. When the lad went home, in September, the sore had closed, and he was in excellent health, as I ascertained by a personal examination. The foot, which had a tendency for a time to turn inwards, was nearly at a proper angle, but was found, on accurate admeasurement, to be three-quarters of an inch shorter than the sound one, while the difference in the length of the legs was only about three lines. Some motion existed at the ankle-joint, which has no doubt since increased.

Partial removal of the astragalus may be effected by the gouge, and it will frequently be well, here as elsewhere, for the surgeon, when he begins the operation, to take some sinus in the neighborhood of the ankle-joint as his guide, a slight enlargement of the opening being often sufficient to enable him to obtain ready access to the seat of the disease.

In a case of caries of the astragalus and calcaneum, Mr. T. Wakley, of London, removed both these bones, together with the malleolar extremities of the tibia and fibula, and had the satisfaction of saving his patient, recovery taking place with a strong and useful foot. Dr. James C. Whitehill recently reported a case of successful excision of the entire astragalus and calcaneum on account of a gunshot wound of the heel and foot.

Excision of the *cuboid* and *navicular* bones does not require any particular notice. When both these bones are involved in disease, the other pieces of the tarsus, and even those of the metatarsus, are also very apt to suffer, and then the question will arise whether Chopart's amputation should not supersede resection. When the cuboid alone is carious, it may easily be dug out with the gouge, but the operation will probably necessitate the removal of the fifth metatarsal bone with the little toe. Partial excision of the navicular bone may be effected in a similar manner.

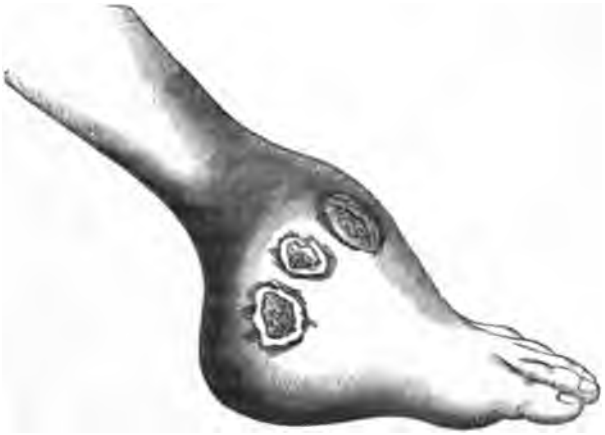
In 1857, Dr. J. T. Bradford, of Kentucky, successfully exsected the entire calcaneal and cuboid bones, together with a small portion of the astragalus, on account of caries, in a lad, fifteen years of age. An excellent recovery ensued, with a good use of the foot, the patient being able, by means of a padded shoe, to walk with great facility, and to work regularly on his farm.

Dr. H. J. Bigelow, of Boston, in 1855, removed the whole tarsus, excepting the calcaneum and astragalus, along with the heads of the second and third metatarsal bones. The operation was soon afterwards successfully imitated by Mr. Skey. In a case cited by Mr. Statham, in the thirty-seventh volume of the Medico-Chirurgical Transactions of London, the cuboid and external cuneiform bones were exsected at a first operation, the scaphoid and remaining cuneiform at a second, and at a third the heads of the second and third metatarsal bones, with a small portion of the astragalus, and yet the patient recovered with an excellent use of the foot, with very little alteration in its natural appearance.

EXCISION OF THE ANKLE-JOINT.

The ankle-joint not unfrequently suffers from scrofulous caries, as seen in fig. 763, from a clinical case; it is also liable to necrosis, especially in cases of compound fractures and dislocations, followed by excessive inflammation. For the relief of these lesions the surgeon usually resorts to amputation of the lower

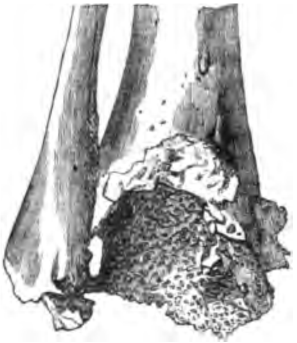
Fig. 763.



Caries of the ankle-joint.

part of the leg, and there can be no question that, as a general rule, it is by far the most expedient procedure, involving hardly any risk to life, and affording an excellent stump. In caries, however, of long standing, where the disease is limited to the articular surfaces of the joint, without any serious implication of the surrounding tissues, excision may be practised with a reasonable prospect of success, a strong and useful, although somewhat shortened, limb being left. The operation was first performed on account of disease in 1792, by the elder Moreau, but, till lately, has not had a place in surgery, and even now professional sentiment is much divided in regard to it. It is done most conveniently by making two vertical incisions, extending along the inner and outer margins of the leg, from the level of the ankle to a height of from two and a half to three inches; the lower angle of each cut is then connected by a semilunar one carried across the upper part of the instep, and the flap thus marked off being dissected up, the joint is exposed, the soft structures carefully detached from the two bones, and the articular ends turned out, and sawn off, if possible, on the same level, as in fig. 764. If the astragalus is diseased, the affected part is now removed with the gouge or pliers, when the raw osseous surfaces are placed in accurate apposition, and so maintained until consolidation has occurred, passive motion being duly attended to in order to obtain a short fibro-ligamentous rather than a bony union. In detaching the soft parts from the tibia and fibula, and severing their extremities, the utmost care must be taken not to injure the tibial arteries or the tendons of any of the long muscles of the foot.

Fig. 764.



Caries of the inferior extremities of the tibia and fibula.

The *statistics* of this operation are by no means gratifying. Of 48 cases, analyzed by Dr. Hodges, only 27 recovered. In 10, subsequent amputation was rendered necessary on account of exhaustion from a return of the original disease. Of the 48 cases, there was a failure, as far as the object of the operation was concerned, in 43.75 per cent., thus contrasting most unfavorably with the very slight mortality after amputation of the leg. It is proper to add that the table of Dr. Hodges comprises a number of cases of partial excision.

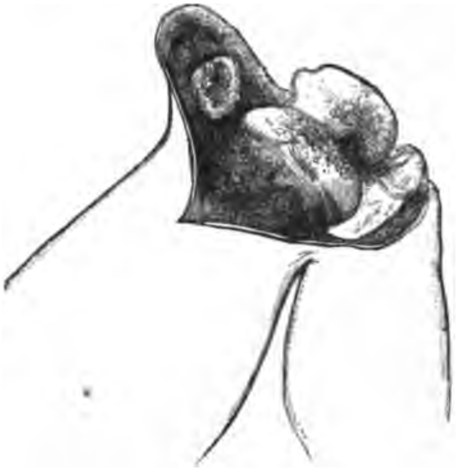
EXCISION OF THE KNEE-JOINT.

It is not a little remarkable, when we consider the great size of the knee-joint, the importance of the structures which surround it, and the intimate sympathetic relations which exist between it and the rest of the system, that it should have been the first articulation which was subjected to excision for the relief of disease. The only plausible explanation which can be given of it is the fact that it is so frequent a seat of white swelling, or scrofulous ulceration, which, until after the middle of the last century, was never thought of being treated in any other manner than by the removal of the affected parts by amputation of the thigh. Excision of this joint was first performed by Mr. Filkin, of Northwich, in Cheshire, in 1762; as, however, no account of it appeared in print, no attention was attracted to it until the publication of the famous case of Mr. Park, of Liverpool, in 1781. Moreau, of France, executed it in 1792, upon a young man, laboring under white swelling. In 1809 the operation was performed by Mulder, of Groningen, in 1823 by Crampton, of Dublin, and in 1829 by Syme, of Edinburgh, the latter repeating it soon after in another case. From this period nothing of special interest occurred in regard to excision of the knee-joint until 1850, when it was revived by Mr. Fergusson, of London. Since then the operation has been practised in numerous instances; and, although the results have been far from being uniformly successful, yet enough has been done to show that the procedure, if properly executed, holds out great promise of a strong and useful limb, in a class of cases which were formerly regarded either as entirely hopeless, or as remediable only by amputation. One of the most able and zealous champions of the operation, at present, is Mr. Butcher, of Dublin, who has perhaps done more than any one else to reduce it to rule.

It is not, of course, every case of diseased knee-joint that is proper for excision. The operation should, as a general rule, be refrained from when there is very extensive structural change of the bones, rendering it necessary to go much beyond their articulating extremities; when the morbid action is of a strumous nature without well defined limits; and when the patient is so young that interference with the shafts of the femur and tibia would inevitably be followed by a serious arrest of development of the limb. In all such cases amputation should take the place of resection.

In regard to the manipulations, various plans have been suggested, any one of which will afford ready access to the diseased bones, but they are all objectionable, on the ground that, the most dependent part of the wound being closed, there is no outlet for the discharges. To remedy this difficulty it has been proposed to pierce the posterior wall of the wound, and to insert a gum-elastic tube to carry off the fluids as fast as they are secreted; a circumstance of paramount importance both as it respects the speedy restoration of the parts and the prevention of pyemia. There can hardly be any doubt that many, if not most, of the accidents that have followed this operation have been due, directly or indirectly, to the accumulation of pus in the bottom of the wound, and its consequent injurious action upon the bones, irritating and eroding their substance, and burrowing more or less extensively among the soft parts. Such, however, is the character of the tissues behind the articulation, as to render it impracticable to approach the femur and tibia in that direction, or to leave the operator any choice in regard to the place of election.

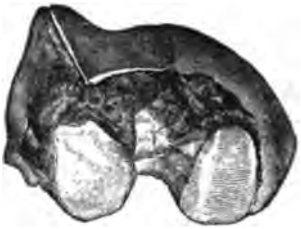
Fig. 765.



Excision of the knee-joint.

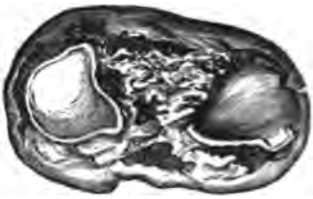
Mr. Park readily accomplished his purpose by means of a crucial incision, the centre of which corresponded with the superior extremity of the patella, the perpendicular cut being nearly six inches in length, while the horizontal one reached almost half round the limb, which was in an extended position. Moreau, on the other hand, made an H-shaped incision, that is, a longitudinal incision along each side of the thigh and leg, between the vasti and flexor muscles, and a transverse one just below the patella. I prefer myself a large semi-lunar, U-shaped or horseshoe flap, as seen in fig. 765, made by carrying the knife across the upper part of the leg, from one condyle to the other; this being carefully raised, affords a sufficient opening for dividing the ligaments, separating the soft parts, and turning out and sawing off the ends of the bones. In general, not more than an inch of the femur, fig. 766, should be removed, and a still smaller slice should, if possible, be taken from the tibia, fig. 767; sometimes, however, it is necessary to cut off much more, the tibia, for example, below its articulation with the fibula, and the femur above its condyles, and yet a useful limb be left. If any sinuses are found to extend into the substance of these bones, after they have been sawn off, they should be followed up with the gouge, and every particle of disease scooped out, with the same care and patience that the dentist drills out the cavity of a tooth preparatory to the introduction of the plug. Any burses that may have been exposed in the operation should also be removed, lest they occasion suppuration, and so retard the cure.

Fig. 766.



Lower end of the femur excised.

Fig. 767.



Upper end of the tibia excised.

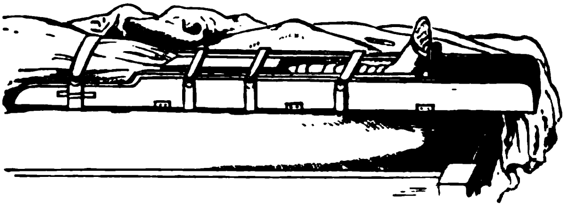
In most cases of disease of the knee-joint, requiring excision, the patella is implicated in the morbid process, and should, therefore, be removed along with the other bones; this course, however, necessarily involves the division of the tendon of the four-headed extensor muscle, and consequently the loss of any action which that muscle might exert upon the movements of the leg, in the event of the formation of an artificial joint during the progress of the case. Hence the preservation of the tendon becomes a matter of great interest, as tending to augment the strength and usefulness of the limb. This can only be accomplished, however, when there is but little disease of the tibia and the patella; for, when the tubercle of the former bone is obliged to be exsected, the tendon or ligament necessarily loses its attachment, and had, therefore, better be removed with the latter. All the ordinary proceedings contemplate the ablation of the patella, and I am quite satisfied that it is, as a general rule, the most judicious practice, even when this bone is perfectly healthy. When the patella is retained, its articular surface should be divested of its cartilage, to promote its union with the surface of the femur, also previously rendered raw. If, notwithstanding this precaution, consolidation fails to occur, and the patella is found to interfere with the cure, lying loose under the integuments, and thus keeping up irritation, no time should be lost in removing it altogether.

It might be supposed that, during the sawing of the bones, the popliteal artery would necessarily be endangered, but this is not the case, the vessel lying altogether beyond the line of the instrument. The hemorrhage, indeed, is usually very slight, ligation of the articular branches being all that is generally required.

During the *after-treatment* the limb should be retained in the extended position, if much substance has been removed, but slightly flexed under opposite circumstances, in order to place it in the most favorable condition for usefulness in the event of anchylosis, which is so liable to happen after excision of the joints, notwithstanding all the precautions that may be taken to prevent it.

Among the more suitable contrivances for accomplishing this object is Mr. Butcher's box, fig. 768, the sides of which can be let down by hinges; it is well padded with horsehair, and readily admits of the requisite degree of extension and counter-extension of the limb.

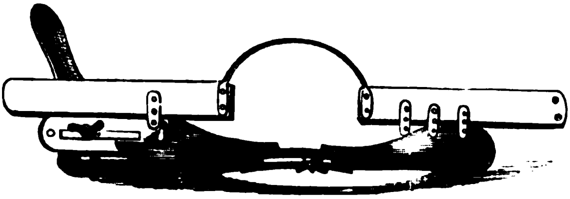
Fig. 768.



Butcher's box for after-treatment in excision of the knee.

Mr. Price's apparatus, delineated in fig. 769, also answers admirably well. It consists of a McIntyre's splint, of thin tinned iron, with a foot-board, between which and the leg there is an open space, in order that there may be no pressure upon the heel and the tendo Achillis. The portion of the apparatus corresponding to the popliteal space is slightly convex upwards, with a view of insuring more accurate apposition of the ends of the bones. A short splint, well padded, should be applied in front of the thigh, while a long one, provided with a central iron hoop and a perineal strap, should be stretched along the outside of the limb.

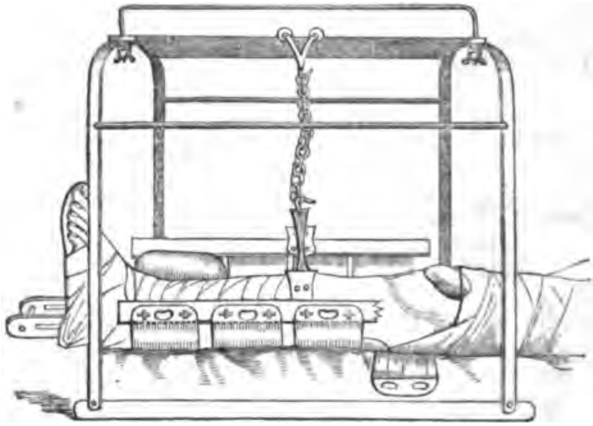
Fig. 769.



Price's apparatus for after-treatment in excision of the knee.

Occasionally the limb may be swung, with great advantage and comfort, in Salter's fracture apparatus, shown in fig. 770.

Fig. 770.



An excised knee swung in Salter's apparatus.

One of the most annoying occurrences to be guarded against is the tendency which the tibia has to be drawn outwards and backwards, by the action of the flexor muscles of the thigh. The best means of counteracting this disposition is the bandage, applied from the hip downwards, the leg being invested in the usual way; or, this failing, the subcutaneous section of the tendons of the offending muscles. When osseous union is expected, the bones should be sawn off a little slopingly behind, so as to enable the parts to afford the degree of flexion essential to the production of a serviceable limb. In this case the extremity should be placed over a double-inclined plane, and be well supported with lateral splints, to prevent bowing of the leg.

Statistics.—The statistics of this operation are of deep interest. In regard to the earlier cases, those of Filkin and Park completely recovered, the patient of the latter having obtained so sound a limb as to be able to go to sea and perform all the duties of a sailor. Moreau's patient died, several months after the operation, of dysentery; of Crampton's two cases, one recovered with a good limb, and the other perished at the end of three years and a half, exhausted by hectic irritation and repeated attacks of erysipelas. Of Mr. Syme's patients one got well and the other died.

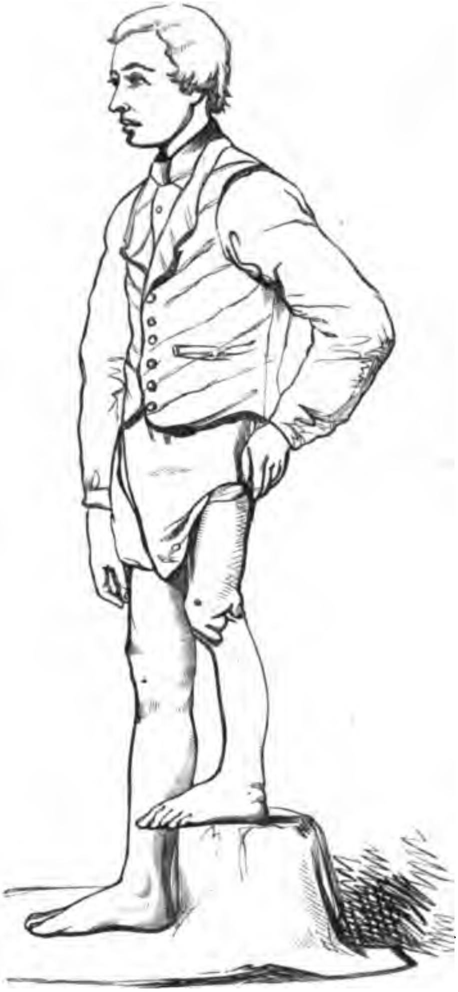
Mr. P. C. Price has collected the particulars of 160 cases of excision of this joint, performed in Great Britain since 1850, on account of disease, deformity, and accident, and of these 32 proved fatal, or in the ratio of 1 to 5. In 8 death was caused by pyemia, in 6 by exhaustion, in 5 by irritation, in 4 by shock, and in the remainder by various affections. It is proper to add that, in many of the cases, the operation was performed as a dernier resort, on account of extensive and protracted disease of the articulation, attended with a worn-out state of the system. In 18 of the 160 cases, the results of the excision were so unsatisfactory as to require amputation of the thigh. Of these 18 operations only one terminated fatally.

Of 208 cases of excision for disease, tubulated by Dr. Hodges, 106 recovered, and 60 were fatal. In 42 cases, subsequent amputation was performed, with 9 deaths, and 7 unknown results. Of the patients that recovered, 65 are stated to have had useful limbs. The causes of death in the fatal cases were principally pyemia, exhaustion, and phthisis: 2 perished of shock.

Mr. Humphry, of Cambridge, England, has reported the particulars of 13 cases, in which he excised the knee-joint, on account of chronic disease, of which only one proved fatal, although four were subsequently obliged to submit to amputation. Mr. Jones, of Jersey, has performed the same operation fifteen times with only one death.

In operating upon young persons, Mr. Humphry suggests the propriety of making the section through the epiphysis, and not through the shaft of the bones, lest, their growth being thus arrested, great deformity from shortening should occur.

Fig. 771.

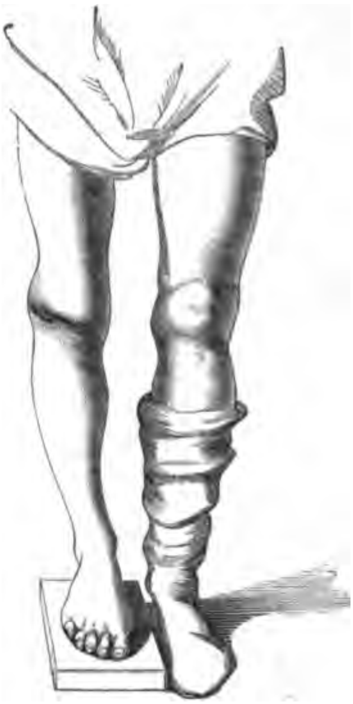


Shortening after excision of the knee.

These effects are strikingly illustrated in the adjoining cut, fig. 771, taken from a case of Mr. Pemberton, of Birmingham. The patient, at the time of the operation, was twelve years of age, and the amount of bone removed was rather more than three inches and a half, of which about two inches and a half belonged to the femur. Six years after the operation the limb was found to be nine inches shorter than the other. A similar case has been reported by Dr. Keith, in a boy whose knee was excised at the age of nine. Five years afterwards the limb was seven inches shorter than the other, and looked, when compared with it, like a mere appendage to the body. It would thus appear that a useful limb cannot be obtained when this operation is performed through the shaft of the bone before the completion of the ossific process, the epiphysis being indispensable to its full development. The annexed cut, fig. 772, affords a good idea of the result of the operation in the adult. The drawing was taken two years after the operation, which was performed by Mr. Hancock, of London.

Assuming that these data afford a fair average result, it will be perceived that the mortality from excision of the knee-joint is considerably less than that from amputation of the thigh, for which it may, therefore, under favorable circumstances, be employed as a suitable substitute.

Fig. 772.



Excision of the knee two years after the operation.

EXCISION OF THE PATELLA.

The patella, though not often diseased, is occasionally affected without the femur and tibia participating in the morbid action. In a man under my care, some years ago, the bone was completely exposed, and almost entirely necrosed, from frost-bite, its surface being as black as charcoal, and its substance greatly softened. By means of the gouge I cut away nearly the whole thickness of the bone, leaving merely its inner table, pared the edges of the ulcer in the soft parts, and, using warm water-dressings, succeeded in effecting an excellent cure, the joint gradually recovering from the stiffness into which it had been thrown by its protracted disuse.

A case in which the entire patella was removed on account of necrosis, the result of a fall, was reported in the North American Medico-Chirurgical Review for 1860, by Dr. O. B. Knode, Missouri. Although the cavity of the articulation was exposed during the operation, the patient, a man, aged twenty-one years, made an excellent recovery, followed by a good use of the limb.

Of 11 cases of excision of the patella, analyzed by Dr. Oskar Heyfelder, 9 recovered, and 2 died, one from gangrene, the other from suppuration. In 8 cases the resection was complete, in 3 partial. The causes necessitating the operation were, in 5 cases, caries, in 3 fracture, and in 3 gunshot injury. In 3 of the cases which survived the excision subsequent amputation was required.

EXCISION OF THE BONES OF THE LEG.

Excision of the long bones of the lower extremity can be practised only to a certain extent, as the removal of any considerable portion would deprive the limb of its solidity, and so render it useless as an instrument of progression and support. Several inches of the shaft of the femur might be exsected, and yet, if osseous union occurred, the thigh would answer an excellent purpose. In badly-treated fractures the limb is often shortened to this extent, the patient walking well afterwards with the aid of a high-heeled shoe. A loss of several inches of the body of the tibia would be a serious accident unless it were accompanied by a corresponding loss of the fibula, in which case, solid union taking place, a good leg might result, while, if the fibula retained its integrity, the limb would not be sufficiently firm for locomotion.

To the above statements the *fibula* forms a striking exception. The loss of a portion of this bone, or even the whole of it, except its malleolar extremity, does not, as is well known, materially affect the functions of the leg and foot. Excision of the entire fibula, originally proposed by Desault, was first executed by Percy and Laurent; Seutin has also performed the operation, and other surgeons, as Béclard and Elliot, have removed considerable pieces of it; generally on account of caries, caries and necrosis, or hypertrophy from syphilitic disease. A case of excision of the entire fibula for fibro-cartilaginous degeneration of that bone was reported, in 1858, by Dr. A. R. Jackson, of Stroudsburg, Pennsylvania. The patient, a female, aged thirty-seven years, made a good recovery with a useful limb.

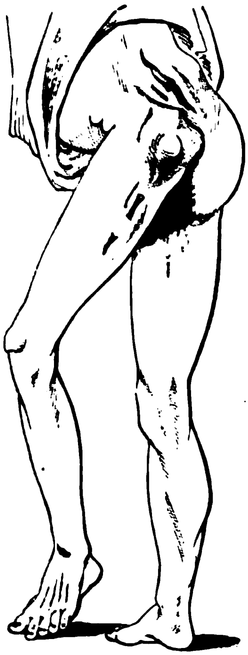
In performing the operation, the bone, exposed by a longitudinal incision, is carefully isolated at its superior extremity, and either disarticulated from the tibia or divided with the pliers. Taking now hold of this part, and using it as a handle, the operator cautiously detaches the remainder of the bone from its muscular connections, and, lastly, from the tibia and astragalus below, keeping all the while the point of his knife as closely against the osseous surfaces as possible. The exsection is usually attended with a good deal of hemorrhage, and, unless proper circumspection is exercised, the peroneal artery may be wounded. During the after-treatment care must be taken to prevent inversion of the foot, to which there is generally a decided tendency whenever the external malleolus is removed.

EXCISION OF THE HIP-JOINT.

Excision of the head of the femur was originally performed in 1822, by Mr. Anthony White, of London. In 1856, the whole of the hip-joint was removed for the first time by Mr. Hancock. Although the operation has been repeatedly executed during the last twenty years, chiefly through the influence and example of Mr. Fergusson, yet such, until recently, was the want of statistical information upon the subject that it was extremely difficult, if not impossible, to arrive at any well-founded conclusions respecting its value, or even its propriety. The great objection that has been urged against it is that, in coxalgia, the morbid action often extends to the acetabulum, if not also to the pelvic cavity; and some, indeed, have even gone so far as to assert that this is always the case in the more confirmed stages of the disease, which, however, is not true, as my dissections fully satisfy me. But granting, for the sake of argument, that it is, the fact would not, in my opinion, constitute a valid objection against the procedure, seeing how easy it would be, in most instances, to gouge out all the carious structure, and thus leave the parts in a condition for gradual reparation. When the acetabulum is deeply involved, a circumstance, however, which cannot always be determined beforehand, either from the symptoms or an examination with the probe, the case will, of course, be proportionately more unfavorable, but even then we need not despair of an ultimate cure, provided the operation is conducted with the requisite care and skill. Left to itself the disease nearly always proves fatal, life being gradually worn out by hectic irritation and profuse discharge. Assuredly, then, unless the patient is in an utterly forlorn condition, both science and humanity would dictate the propriety of interference in the hope of rescuing the individual from his impending fate. I am satisfied that conservative surgery has not yet had fair play in this class of cases of hip-joint disease; the objection, I conceive, ought not to lie against the operation, but against the time at which it is performed, which is often too late to afford the benefits which it would otherwise be capable of conferring. When the head and neck of the thigh-bone alone are diseased, excision, early and judiciously practised, will not only prevent much suffering, but be instrumental in saving many lives. When the disease has committed such ravages as are displayed in fig. 773, from a drawing of one of my clinical cases, it is impossible for any surgeon to produce a good result.

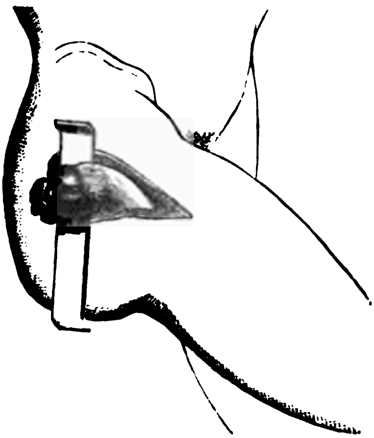
In contemplating the manual part of the *operation*, several plans suggest themselves to the consideration of the surgeon. In the first place, he may adopt the method followed by White, of making simply one longitudinal incision, in the axis of the head and neck of the bone, of which he was thus readily enabled to remove four inches; or, he may give his incision a T, L, or V-shaped appearance; or, finally, what is preferable to any of these procedures, he may form a semilunar flap of the gluteal muscles, with the convexity downwards. This plan of incision has the advantage not only of allowing free access to the joint, but also of affording a ready outlet for the discharges at the lower and outer angle of the wound. The superior extremity of the femur, being thus exposed, is thrust through the opening, as seen in fig. 774, from Erichsen, by carrying the limb across the sound one, rotating it inwards, and then pushing it up, when it is to be divided immediately below the limits of the morbid action, fig. 775, by means of a narrow saw, the soft parts being carefully protected from injury during the movements of the instrument. The great trochanter, however sound, should always be included in the operation, otherwise it will be sure to interfere more or less seriously with the healing process by projecting into the wound, and obstructing discharge. Any disease that may exist in the acetabulum, whether at its margin or in its bottom, is to be freely removed with the gouge. There is seldom much bleeding, but a few small arteries may require ligation. The wound is approximated in the usual way, a small tent being inserted at the external and inferior angle; and the limb, placed in the straight position, is supported with a carved splint, with a window opposite the joint, to admit of the necessary examination and dressing. Until the primary effects of the operation are over, all attempts at extension and counter-extension will be likely to prove extremely painful, if not positively mischievous; but by degrees this must be rigidly attended to, lest the limb, when well, be too short to be either seemly or

Fig. 773.



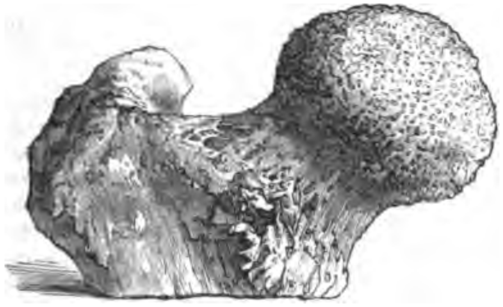
Ravages of hip-joint disease.

Fig. 774.



Excision of the hip-joint.

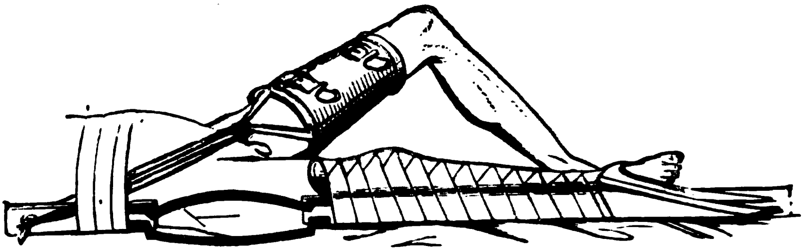
Fig. 775.



Portion of femur removed for hip-joint disease.

useful. The object may, in general, readily be attained either with a bracketed Desault splint, or with the apparatus of Mr. Fergusson, depicted in fig. 776, the extension in the latter case being made from the opposite thigh by means of a laced socket having a band attached to the upper extremity. One of the difficulties experienced after the operation is to keep the end of the femur in contact with the acetabulum.

Fig. 776.



Fergusson's apparatus for the after-treatment in excision of the hip-joint.

The length of femur requiring to be excised must, of course, be very variable. Sometimes mere removal of the head with a portion of the neck will suffice, though, in general, it will be necessary to include more or less of the shaft. In a case lately operated upon by Dr. William H. White, of Wilmington, Delaware, he excised the head of the bone and about four inches of the body, and succeeded in effecting an excellent cure, notwithstanding that the patient, a man, nearly thirty years of age, had been greatly exhausted by long-continued suffering from the effects of coxalgia.

Statistics.—The statistics of this operation are of great interest. The most elaborate yet furnished are those by Dr. Lewis S. Sayre, in a paper on "Morbus Coxarius," published in 1860. They refer exclusively to operations performed for the relief of hip-joint disease, and embrace altogether 110 cases, of which, however, 18 are doubtful, leaving thus 92 reliable ones. Of these 92 cases, 42 recovered, 37 died, and 13 were still under treatment at the time they were reported.

In the American Journal of the Medical Sciences for July, 1861, is a paper on the same subject, by Dr. Charles K. Winne, in which 49 cases of excision of the hip-joint on account of coxalgia are tabulated. Of these, 20 recovered, 15 died, 11 were doing well when reported, and of 3 the result had not transpired. Dr. Hodges has tabulated 133 cases of excision of the hip-joint for disease, with one death in every $2\frac{5}{63}$ cases.

It will thus be perceived that the mortality from this operation is immense, a circumstance which is not surprising when it is remembered that it is often performed, as a dernier resort, when all other means of relief have failed, and when life is rapidly ebbing away under the wasting effects of the disease. Doubtless, too, the results of the operation are much more favorable in the hands of some surgeons than in those of others. As a proof of this, it may be stated that, of 7 cases in the practice of Mr. Erichsen, not one proved fatal; 3 completely recovered, 2 were lost sight of after they had left the hospital, and 2 died from constitutional disease, one eleven months and the other two years after the operation.

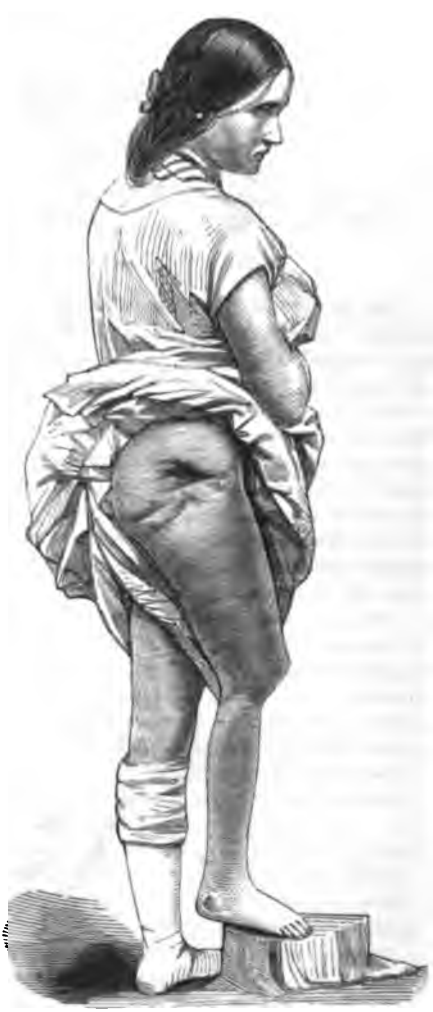
In some of the fatal cases in Dr. Sayre's table, as well as in that of Dr. Winne, death occurred within the first week, ten days, or a fortnight after the excision, either from the violence of the resulting inflammation, excessive suppuration, secondary hemorrhage, erysipelas, pyemia, or phlebitis. In others the patient recovered from the immediate effects of the operation, but fell a victim, at a variable period, to intra-pelvic abscesses, caries or necrosis, phthisis, Bright's disease, enlargement of the liver, tubercular meningitis, or some other incidental malady. In not a few of the cases the operation seems to have been performed imperfectly, or when the disease had made such progress as to render recovery absolutely impossible.

The appearances of the limb after excision of the hip-joint for coxalgia are well illustrated in fig. 777, from a case of Mr. French, of London. The drawing was taken twelve years after the operation.

Dr. George Williamson has collected the histories of 11 cases of excision of this joint for *gunshot* injury, of which only one recovered, the patient being a man, twenty-five years of age, and the femur being sawed off below the trochanter. Of these cases six occurred in the Crimean war.

Dr. Hodges has constructed from a variety of sources a table of 21 cases of removal of the head of the femur, spontaneously separated from the rest of the bone, of which only 5 proved fatal.

Fig. 777.



Appearance of the limb twelve years after excision of the hip.

EXCISION OF THE GREAT TROCHANTER.

Excision of the great trochanter is occasionally required on account of caries of its substance. It was first performed by Ténon, in 1798, and has since been repeated in a considerable number of instances, for the most part with a very gratifying result. The principal operators have been Velpeau, Textor, J. F. Heyfelder, Teale, Willard Parker, and Fergusson. The latter has had two cases, one of which proved fatal at the end of the first week, in consequence of an attack of erysipelas.

The operation itself is not difficult of performance, the carious prominence being easily exposed by a longitudinal or slightly curvilinear incision, and removed with a small saw, the gouge, or the pliers. The hemorrhage is usually inconsiderable. The two circumflex arteries are endangered only when the knife is obliged to be carried deeply and extensively round the base of the trochanter. The excision of the bone will be much facilitated if the limb is thoroughly inverted during the operation. When more room is required than usual, the surgeon may make a T-shaped incision, with the base downwards, to afford a better outlet for the discharges. Great care is taken not to open the capsular ligament of the hip-joint.

CHAPTER XXII.

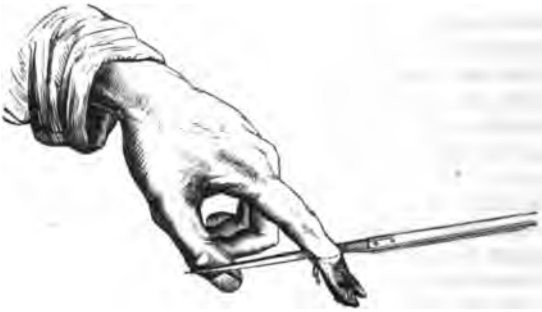
SPECIAL AMPUTATIONS.

1. SUPERIOR EXTREMITY.

AMPUTATION OF THE HAND.

THE fingers may require removal either in their continuity or at their articulations. When the distal phalanx alone is involved, as when it is in a carious or necrosed condition, the operation should, if possible, be limited to the bone, the nail and soft parts being preserved. In disease of the bone from whitlow, such a procedure is nearly always feasible, and, when the periosteum has not been destroyed, is not unfrequently followed by a reproduction of the phalanx, although rarely in a perfect manner. It is only, therefore, when the parts have been crushed by machinery or some other cause, that, as a general rule, the finger should be cut off at the last joint. The operation is performed by making a short, semilunar incision from one side of the finger to the other, on its dorsal surface, the convexity presenting towards the nail, as seen in fig. 778. Turning back the integument, the knife is inserted into the articulation, and, the ligaments being divided, it is drawn forwards, in close contact with the palmar aspect of the bone, so as to form a large convex flap, which is then retained by several points of suture.

Fig. 778.

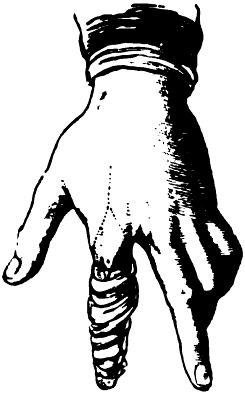


Amputation of the finger, at the distal articulation.

In amputation of the finger in the continuity of the second phalanx, the operation may be performed either by the circular method, or by two flaps taken laterally or from the dorsal and palmar surfaces, the bone being divided with a sharp pair of pliers. It is hardly necessary to add that it is always desirable to save as much of the member as possible, both on account of utility and seemliness.

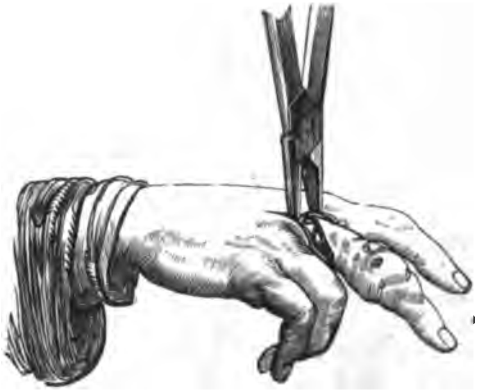
Excepting the index finger, amputation should never be performed at the first phalangeal articulation, as the stump thus left would not only be disfiguring, but inconvenient. Hence, when the operation is required, it is much better to remove the bone at its junction with the metacarpal bone. This may readily be done by making two lateral flaps by circumscribing the posterior extremity of the first phalanx by two long, semilunar incisions, fig. 779, commencing at the centre of the knuckle of the metacarpal bone behind, and terminating at the middle of the palmar aspect of the member on a level with the web of the contiguous fingers. During the disarticulation, the finger is forcibly flexed, so as to afford an opportunity of severing the extensor tendon above the joint, as it would otherwise be in the way of the stump. Before approximating the flaps, the projecting portion of the knuckle of the metacarpal bone should be cut off with the pliers, as in fig. 780, in order to give the part a more seemly appearance. Generally, two small arteries require the ligature. During the cure, the fingers must be confined upon a carved splint, otherwise they may overlap each other, and thus become, in great measure, useless.

Fig. 779.



Amputation of the finger at its metacarpo-phalangeal joint.

Fig. 780.



Removal of the bone with the pliers.

In amputating the index finger, a very useful stump may be formed by disarticulating the middle joint, especially in laboring subjects, or in those engaged in mechanical pursuits. In the rich, on the contrary, the hand will present a better appearance if the finger be removed at its connection with the metacarpal bone.

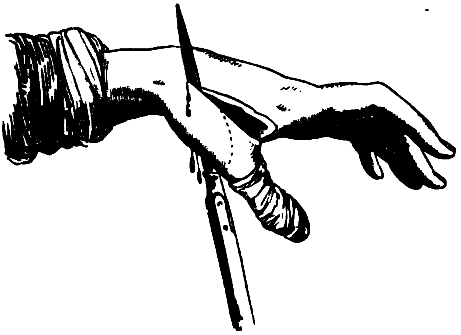
It is seldom that all the fingers are simultaneously affected by disease, so as to require removal at the metacarpo-phalangeal joints, but such a procedure may become necessary on account of accidents crushing the bones and extensively bruising and lacerating the soft parts. The operation, which is sufficiently easy of execution, is performed by making two flaps, one on the dorsal and the other on the palmar aspect of the hand, by two incisions, slightly convex in front, the posterior extending over the roots of the fingers, about half an inch in front of their junction with the metacarpal bones, while the anterior one is carried across the hand on a line with the web of the fingers. The best plan is to form the dorsal flap first, and then, after having reflected it back, and divided the tendons and ligaments, to fashion the other by cutting from above downwards, and from behind forwards. The appearance of the stump will be greatly improved if the projecting portion of each knuckle of the metatarsal bones be sloped off a little with the pliers.

A useful, and not unseemly, stump may be formed by amputating the metacarpal bones in their continuity, leaving, perhaps, the thumb or one of the fingers, the principal flap being taken from the substance in the palm of the hand. In case of accident, crushing the bodies of these pieces, the operation might be performed through their posterior extremities, from a third of an inch to three-quarters of an inch in front of their junction with the second row of carpal bones, or even at the carpo-metacarpal articulations, although, from the irregularity of the contiguous surfaces, the task would by no means be an easy one, nor would the resulting stump be as smooth as it ought to be, either for usefulness or seemliness.

Cases occur, both of accident and disease, demanding the removal of one of the metacarpal bones along with the corresponding finger. The operation is executed by making a triangular incision over the back of the hand, the apex of which is directed towards the wrist, while the base extends round the root of the finger in front, hardly any integument being sacrificed. The extensor tendon being cut far back, the bone, isolated from its muscular connections, is either separated at its carpo-metacarpal articulation, or divided in its continuity, in a sloping manner, by means of the pliers.

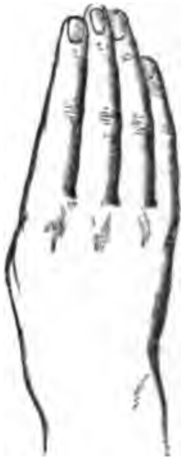
Amputation of the *thumb* at the distal joint, or in the continuity of its first phalanx, may be performed in the same manner as amputation of the fingers, and, therefore, does not require any particular notice. When both its bones are fatally implicated, whether by disease or accident, the hand will exhibit a much more seemly appearance if the member be removed at the carpo-metacarpal joint. For this purpose, a triangular incision is made along the radial aspect of the hand, beginning about an inch in front of the styloid process of the radius, one line extending to the centre of the web between the thumb and index finger, while the other passes round the outside of the head of the metatarsal bone, a little behind the joint, both meeting in front of the palm, as represented in fig. 781. The muscles being now detached, and the extensor tendons severed behind, the disarticulation is readily effected by bending the thumb forcibly inwards towards the ulnar margin of the hand. In performing the operation, the hand is placed in a state midway between pronation and supination, the fingers being fully extended and the thumb abducted. Care must be taken not to include too much integument in the incisions. When the flaps are properly shaped, they usually unite by the first intention, and leave a very insignificant cicatrice. The annexed cut, fig. 782, shows the appearance of the hand after the parts are healed.

Fig. 781.



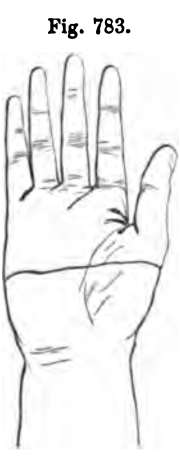
Amputation of the thumb and metacarpal bone.

Fig. 782.



Appearance of the hand after amputation of the thumb.

Fig. 783.



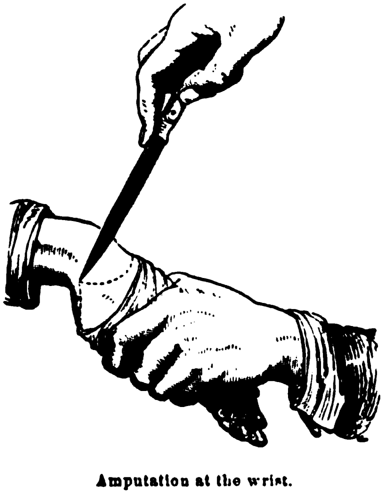
The *little finger* is sometimes removed along with the metacarpal bone, at its junction with the unciform bone. Two incisions are made over the back of the hand, extending from the carpo-metacarpal articulation forwards, along each side of the root of the finger, and terminating at the centre of its palmar aspect, on a line with the web which connects it with the ring finger. The soft parts are now carefully detached from the bone, which is then forcibly flexed and disarticulated by inserting the knife into the back of the joint. Unless this rule be closely followed, the operation will prove difficult, on account of the peculiar conformation of the articulating surfaces of the two bones.

A useful stump may sometimes be made, in disease or accident of the hand and fingers, by preserving the carpus or the carpus and a portion of the metacarpus. The adjoining sketch, fig. 783, kindly sent to me by Dr. Lente, represents a case of this description. Notwithstanding the loss of a large portion of the integument, the parts cicatrized very firmly, and the patient derived great comfort from the use of an artificial hand, the motions of the wrist-joint remaining unimpaired.

AMPUTATION AT THE WRIST.

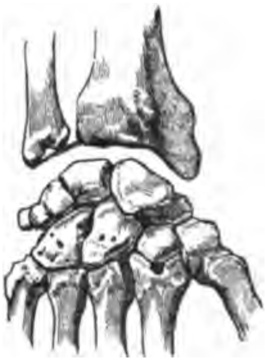
Disarticulation at the wrist should always be preferred to amputation of the forearm whenever it is practicable, inasmuch as the mutilated extremity affords a much longer lever, which may afterwards be used with great advantage for various purposes, at the same time that it is more easily adapted to an artificial hand. I have repeatedly seen persons who, after this operation, enjoyed an amount of action in the limb that was truly astonishing, and who expressed very great satisfaction at having so good a weapon of defence in accidental pugilistic rencounters, the long stump enabling them to deal a most powerful blow. The operation is performed by making two flaps, an anterior and posterior, about two inches long, the convexity looking forwards towards the hand, as shown in fig. 784. They should be formed by cutting from without inwards, as we are thus enabled to give them a much better shape. The incision should extend from the styloid process of the ulna to that of the radius, which should previously be felt for, and then taken as guides to the knife. The disarticulation is effected by inserting the instrument into the posterior part of the joint, the hand being forcibly flexed, and held perfectly prone at the time. This step of the operation will be greatly facilitated if the surgeon bear in mind the peculiar conformation and arrangement of the two surfaces of the joint, as seen in fig. 785. The hand being removed, the styloid processes are cut off on a level with the cartilaginous incrustation of the ulna and radius, when, the arteries of the wrist being tied, and the extensor and flexor tendons, if necessary, properly retrenched, the flaps are approximated and retained in the usual manner.

Fig. 784.



Amputation at the wrist.

Fig. 785.

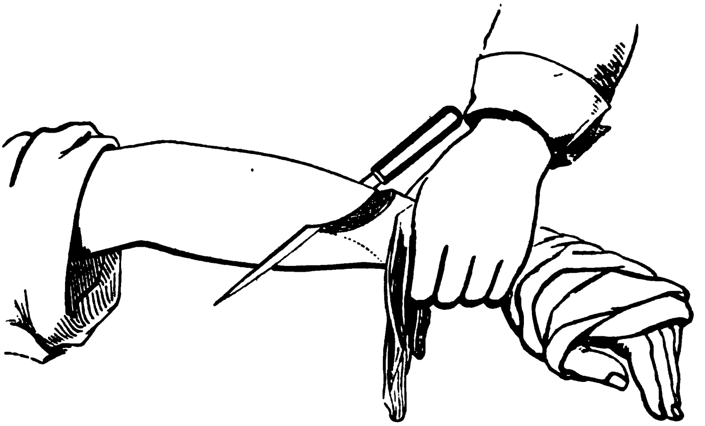


Wrist, carpal, and metacarpal joints.

AMPUTATION OF THE FOREARM.

The forearm may be removed in its continuity in any portion of its extent, but when the surgeon has his choice, the operation should be performed as low down as possible, for the reason that, as stated in the preceding paragraph, the longer the stump is the more useful it will be. The flap method is the one which I usually prefer, but the circular also answers exceedingly well, and is regarded by many as altogether superior to the other. When the patient is very fleshy, it is best to form both flaps by transfixion, one on the anterior and the other on the posterior surface of the limb, as in fig. 786; under opposite circumstances, one should be fashioned by cutting from without inwards, and the other by cutting from within outwards, as we are thus enabled to give them a more suitable shape and size. The extremity is held in a state midway between pronation and supination, the brachial artery is compressed by a tourniquet or the fingers of an assistant, the interosseous structures are divided on a level with the retracted flaps, and the saw is worked in such a manner as to sever both bones simultaneously, or, if practicable, the ulna a little before the radius, as the latter, from its more direct connection with the hand, affords a better support during the operation, and thereby prevents splintering of the osseous tissue. This occurrence, however, may, in general, be effectually obviated if the surgeon, during the sawing of the two bones, takes care to apply his thumb and fingers strongly to the interosseous space.

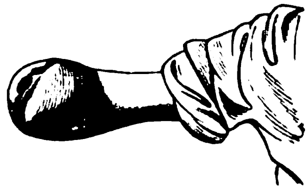
Fig. 786.



Amputation of the forearm.

In performing the circular operation, it is advisable, on account of the smaller quantity of tissue, to draw the soft parts forcibly back by means of a three-tailed retractor, but such a procedure is never necessary when the amputation is done as here described. The radial, ulnar, and interosseous arteries alone generally require ligation.

Fig. 787.



Short stump of the forearm.

I have seen some cases of amputation of the forearm only about two inches or two inches and a half below the elbow, with a most excellent result, the stump being rounded off and well shaped, perfectly movable, and quite serviceable. The annexed drawing, fig. 787, taken several years after such an operation, exhibits the appearance of the limb.

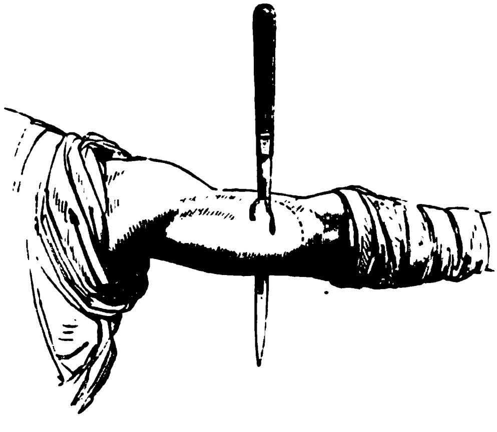
AMPUTATION AT THE ELBOW.

Amputation at the elbow is seldom performed, a circumstance which is the more surprising when we consider what an admirable stump it leaves, what little risk it involves, and how promptly the parts usually heal. Besides these advantages, which experience has fully established, the operation is one of the most easy in surgery, and may, therefore, be performed by any one who has a competent knowledge of the anatomy of the joint. Two flaps are formed, the principal one in front of the elbow, at the expense of the muscles in that situation, and the other, which is entirely cutaneous, behind, the length of the former varying from two and a half to three inches, according to the diameter of the limb. The forearm being slightly flexed, so as to bring the sharp edge of the coronoid process on a line with the articular surface of the humerus, the surgeon transfixes the structures in front of the joint, on a level with the two condyles, and, carrying the knife downwards in close contact with the bones, thus forms the anterior flap, taking care not to give it too great a degree of convexity. The posterior flap is then made by drawing the knife across the back part of the limb, in a somewhat semilunar direction, the ends of the incision connecting themselves with those of the preceding one. The next step of the operation consists in dividing the ligaments which unite the radius and ulna to the humerus, and in sawing the olecranon process from before backwards, leaving all that portion which lies above the level of the joint, and which receives the insertion of the three-headed extensor muscle. It is not necessary to interfere with the articular cartilage of the humerus, but it will improve the shape of the stump if the inner trochlea of that bone is cut off on a line with the other surface, as may usually be readily done in severing the olecranon.

AMPUTATION OF THE ARM.

In amputating the arm, the same general rules are applicable, as it respects the point of election, as in the removal of the forearm, already described. The stump should be as long as possible; and the best covering for it is obtained by taking two flaps, one from the anterior, and the other from the posterior aspect of the limb, the former being usually formed last, as it contains the brachial artery. The soft parts being firmly grasped, and held away from the bone, the transfixion is effected in the usual manner, the knife being carried downwards for a distance of two and a half to three inches, according to the dimensions of the limb, as shown in fig. 788. When the muscles are very large and firm, the surface of the flaps should be rather concave, to prevent redundance of substance. The bone being sawed, the brachial artery and its branches are secured, and the flaps approximated by suture and plaster. The circulation in the limb, during the operation, is controlled by compression of the axillary artery, or of the subclavian above the clavicle.

Fig. 788.



Amputation of the arm.

The *statistics* of this operation, for the relief of disease and ordinary accidents, are sufficiently flattering. Amputation of the upper arm in gunshot wounds is much more disastrous than resection of the elbow-joint for similar lesions. Of

54 cases of the former, mentioned by Esmarch, 19 proved fatal, while of the latter only 6 out of 40 died. The British surgeons in the Crimea removed the upper arm in 162 cases, with a loss of 25, or a mortality of 15.4; 96 of the cases being primary. Of the 6 secondary cases, 3 perished.

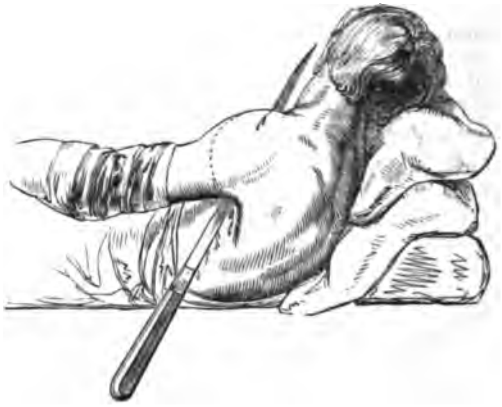
AMPUTATION AT THE SHOULDER.

Of the numerous plans that have been devised for amputating the shoulder-joint, I shall content myself with an account of the following, an acquaintance with which will enable the surgeon readily to meet any emergency that may arise in practice, whether civil or military. In performing these operations, the circulation in the limb must be controlled by compressing the subclavian artery above the clavicle, either by means of the handle of a large key, or, what is much better, the compressor, described and delineated in the chapter on amputations, vol. i. p. 548. The head and chest should be well elevated by pillows, and the shoulder brought over the edge of the table, so as to allow the knife the most perfect freedom.

Amputation at the shoulder-joint is one of the most easy operations in surgery. Richerand long ago remarked that it might be performed with the same celerity with which an adroit carver separates the wing of a partridge, and nothing is more true, although I have occasionally seen a case in which the surgeon consumed time enough not only to cut up the whole bird, but also to devour it.

1. One of the best methods of performing this operation is that of Baron Larrey, which consists in making two oval flaps, one in front and the other behind, as in fig. 789, each being from three to three inches and a half in length. The limb being held horizontally, away from the body with the hand in the prone position, the knife is introduced immediately beneath the acromion process of the scapula, and carried down through the centre of the belly of the deltoid muscle, for about two inches and a half, when, changing the line of direction, it is drawn round the upper extremity of the humerus, as far down as the centre of the axilla, the flap thus formed exhibiting a well-marked convexity in front. A similar flap is then made on the opposite side, when the elbow is carried forcibly backwards, behind the level of the trunk, to facilitate the disarticulation, which is effected by cutting closely from above downwards, round the margin of the glenoid cavity, as in fig. 790.

Fig. 789.



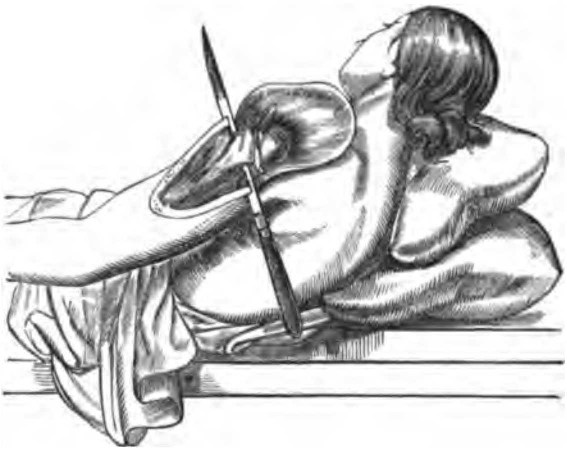
Amputation at the shoulder.

Instead of forming the flaps as here directed, they may be made by transfixion, or cutting from within outwards, although the former is, on the whole, the better method.

2. Supposing the left shoulder to be the subject of amputation, the knife is introduced at the inferior margin of the axilla, and brought out about half an inch beneath the clavicle, just beyond the acromion process. By now drawing the instrument downwards, in close contact with the humerus, a large flap is formed, mainly at the expense of the deltoid and broad dorsal muscles. The capsular ligament being put upon the stretch by carrying the elbow across the front of the chest, disarticulation is readily effected, and the other flap formed by

cutting the soft parts on the antero-internal portion of the limb. If the right shoulder be the seat of operation, the transfixion must be commenced above.

Fig. 790.



Amputation at the shoulder, the joint being exposed.

3. Lastly, an excellent stump may be formed by making the flaps at the outer and inner aspects of the joint. The elbow being elevated so as to depress the head of the humerus, and the cushion of the shoulder raised, the knife, supposing the left side to be the subject of operation, is thrust in at the posterior margin of the deltoid and brought out at the anterior, the flap being formed almost exclusively of the substance of that muscle. The soft parts being held up, the exposed joint is entered in the usual manner, and the other flap made at the expense of the structures in the axilla, by cutting from above downwards.

It is proper to state that amputation at the shoulder-joint may be attended with the entrance of air into the veins of the axilla, as in the interesting case recorded by Roux, in which, almost before the disarticulation was completed, the man fell back dead upon the table. Such an event would be most likely to occur when there is great condensation of the surrounding tissues from inflammatory deposits favoring canalization of the veins.

The *statistics* of this amputation exhibit a less flattering result than one might have been led to anticipate from a consideration of the size of the articulation and the nature of the structures concerned in its execution. From the tables of Dr. Stephen Smith, published in 1853, it appears that, of 71 cases occurring in American and European hospitals, 34 proved fatal, thus showing a mortality of nearly 50 per cent. The advantages of primary over secondary amputation at the shoulder-joint, in military practice, are well-illustrated by the facts furnished by the late Mr. Guthrie. Thus, of 19 cases in which the operation was performed soon after the receipt of the injury, all, save one, recovered; whereas, out of 19 others, which underwent secondary amputation, 15 died. In the Crimean war, the British surgeons removed the arm at the shoulder-joint in 39 cases, with a fatal issue in 13, or 33.3 per cent., 33 being primary, with 9 deaths, and 6 secondary, with a fatal issue in 4. The tables of Dr. Smith embrace 39 cases of disarticulation of the shoulder-joint in American practice. Of these 18 were fatal, and one doubtful, being a mortality of nearly 45 per cent. It is said that Larrey and his colleagues in the wars of Napoleon had amputated at the shoulder-joint in upwards of 100 cases, more than 90 of which recovered.

AMPUTATION ABOVE THE SHOULDER-JOINT.

Several instances have been recorded of recovery after the arm and scapula had been completely torn away by machinery; and surgeons, profiting by a knowledge of this fact, have not hesitated to remove these parts for the relief of injury and disease. In 1830, Gaetani Bey, of Cairo, performed an operation of this kind upon a boy, fourteen years of age, on account of extensive laceration and fracture of the shoulder. After amputation at the glenoid cavity, the scapula was found to be much shattered, and was accordingly taken away, along with the projecting end of the clavicle. The lad made an excellent recovery. Dr. George McClellan, in 1838, amputated the arm with the scapula in a youth of seventeen, on account of an enormous encephaloid tumor. Very little blood was lost during the dissection, and the patient survived the operation upwards of six months, when he died from a recurrence of the disease.

Amputation above the shoulder-joint was successfully performed by Dr. Mussey in 1845, on account of osteo-sarcoma. The removal included the entire scapula, the arm, and the outer half of the clavicle. A similar operation was performed, in 1846, by Dr. Gilbert, of this city, upon an elderly gentleman, the subject of a large encephaloid growth of the shoulder. In this case, however, only a portion of the scapula was taken away. The patient recovered from the immediate effects of the operation, but died some months afterwards from a return of the malady.

In amputating in this situation the surgeon should take care, first, to save a sufficiency of integument, and, secondly, to prevent undue hemorrhage. The incisions should extend, on the one hand, from the superior angle of the scapula along the upper border of that bone, and, on the other, from the anterior surface of the clavicle, nearly as far inwards as its middle, round the shoulder-joint, and thence down to the inferior extremity of the scapula, in a line with its axillary margin. The flaps thus marked out, should then be rapidly dissected up, with as much soft substance as possible, and the different muscular connections severed. The collar bone should be sawn through near its middle, but not until after the separation of the scapula, as the weight of the arm, by drawing down the shoulder, will greatly facilitate this step of the proceeding. The axillary artery should be divided last, and should instantly be tied. If the tumor, necessitating the operation, is uncommonly bulky, it might be well to secure the subclavian as a preliminary matter, but such a measure will seldom be required.

After the bleeding has ceased, the wound is closed in the usual manner, and every effort is made to insure its rapid healing. The lungs should be watched with special care.

2. INFERIOR EXTREMITY.

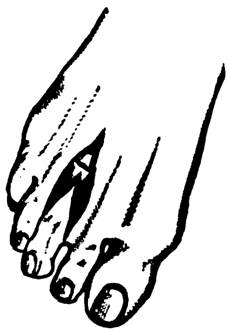
In performing the more important amputations of the inferior extremity, the circulation is usually most effectually controlled by compression of the femoral artery, in the upper portion of its course, by means of the tourniquet, or, if the patient is very thin, by the fingers of a trustworthy assistant, just below Poupart's ligament. In removing the foot and lower part of the leg, the compression may be applied to the popliteal artery. In describing amputation at the hip-joint, special mention will be made of the manner of preventing hemorrhage in that operation. When recourse is had to the tourniquet, the surgeon takes care, before applying the instrument, to elevate the limb, and to press the blood out of the superficial veins from the heel upwards. This precaution is particularly important in weak, anemic subjects, in whom the loss even of a few ounces of blood is often followed by the most serious consequences.

AMPUTATION OF THE FOOT.

The toes are never removed in their continuity or at the phalangeal articulations, inasmuch as the stump thus left would only be in the way of the patient, and thus occasion serious inconvenience, if not positive suffering, from being constantly impinged upon by the shoe or boot. It is for this reason that the operation should always be performed at the metatarso-phalangeal joints; and this may be readily done when all the toes are involved, as, for example, in gangrene and frost-bite, by taking the principal flap from the plantar aspect of the foot. The amputation is commenced by making an incision across the back of the limb, from one side to the other, immediately in front of the metatarso-phalangeal articulations, which, the integuments having been dissected up, are then entered with the knife, an ordinary narrow-bladed scalpel, and successively divided from above downwards, the operation being finished by carrying the instrument forwards to a level with the web of the toes, in order to obtain a sufficiently large covering from the sole of the foot. There is no necessity for cutting off the ends of the metatarsal bones. Any bleeding vessel that may exist being ligated, the plantar flap is stitched in place, and maintained by adhesive strips, aided by an appropriate bandage.

When only one of the smaller toes is to be removed, the operation should be performed with oval flaps, fig. 791, as in amputation of the fingers at the metacarpo-phalangeal articulation. The disjunction will be facilitated by forcibly flexing the toe. The extensor tendon should be divided above the joint.

Fig. 791.



Amputation of the toe at its metatarso-phalangeal joint.

When the small toe is removed, whether alone, or along with the adjoining one, the stump will be much more seemly, as well as more useful, if a small portion of the corresponding metatarsal bone be cut off, so as to give the part a sloping appearance, as in one of my cases at the Philadelphia Hospital. In the ordinary operation the stump is very angular, and the consequence is that it is constantly irritated by the pressure of the shoe.

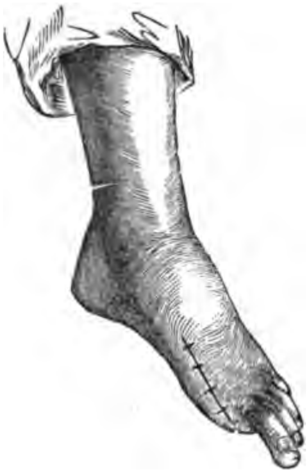
When the *great toe* requires removal, the operation should be performed through the continuity of the metatarsal bone, and not at the metatarso-phalangeal articulation, as in this case the large head of the metatarsal bone would sadly interfere with the wearing of the boot. Two incisions are made along the dorsum of the foot, commencing at an acute angle a short distance in front of the internal cuneiform bone, passing round each side of the toe anteriorly to the joint, and terminating at the centre of the web which connects the big toe with the adjoining one. The soft structures being carefully detached, the metatarsal bone is sawn through in a sloping direction, including fully one-half of its length. The sesamoid bone is removed along with the extensor tendon of the toe. The wound usually heals very promptly, and the cicatrice, corresponding with the dorsum of the foot, is seldom productive of inconvenience when the patient begins to walk, especially if proper attention has been paid during the operation to the preservation of the integument. The appearance of the parts is well shown in fig. 792, representing the approximation of the wound by suture.

When the whole of the metatarsal bone requires removal, the operation is performed with a large flap, extending from a little in front of the metatarso-phalangeal joint to a few lines beyond the internal cuneiform bone. The whole process will readily be understood by reference to fig. 793.

The foot is sometimes removed at the *tarso-metatarsal* junction. The operation, however, is seldom practised, as it is rare that the diseases and accidents requiring such a procedure are confined entirely to the metatarsal bones; besides, such is the manner in which these pieces are connected to each other and to the tarsal bones that it is one of unusual difficulty. When deemed necessary, it should be executed according to the plan originally suggested and described by Mr. Hey, of Leeds, in his Practical Observations on Surgery. The operator, taking the tubercle of the fifth metatarsal bone and the projection of the scaphoid as his guides, forms a large convex flap on the plantar surface of the foot, by carrying his knife as far forwards as the ball of the toes. In order to give more precision to his incision, a line may previously be traced in ink across the foot, along which the knife is then passed in the transfixion; or, what is preferable, the flap is made by cutting from without inwards, and from before backwards.

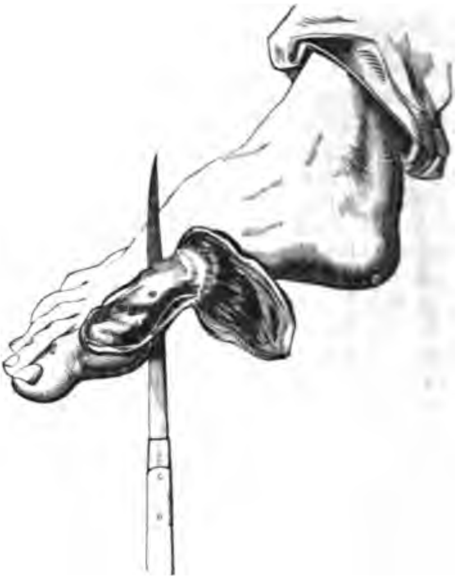
The latter is the method which I generally adopt, because it enables us to give the flap a rounder and smoother shape, thereby avoiding the necessity of trimming it after the operation is completed, as is usually the case when performed in the ordinary way. The dorsal flap, represented in fig. 794, is comparatively small, and is composed entirely of integument; it is slightly convex, and is easily made with a large scalpel. The soft parts being dissected up, each joint is entered separately, the disarticulation being expedited by bending the anterior extremity of the foot forcibly backwards. In executing this step of the operation, it is important to remember the oblique shape of the fifth metatarsal bone, at its articulation with the cuboid, and the peculiar manner in which the head of the second metatarsal bone is locked in between its fellows, as exhibited in fig. 795, as well as the distance to which it projects behind the level of the tarso-metatarsal junction. Owing to these circumstances, it is generally extremely troublesome to disengage it; and hence it is always best to leave it, by sawing through its body on a line with the other joints. The stump, after removal of the parts, in Hey's operation, is seen in fig. 796. The plantar and dorsal arteries

Fig. 792.



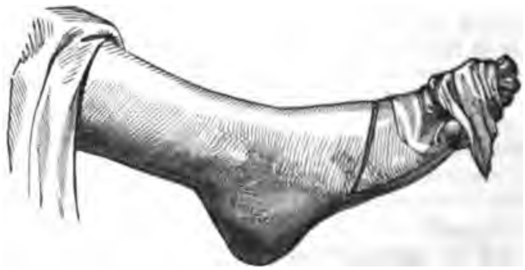
Appearance of parts after amputation of the big toe with its metatarsal bone.

Fig. 793.



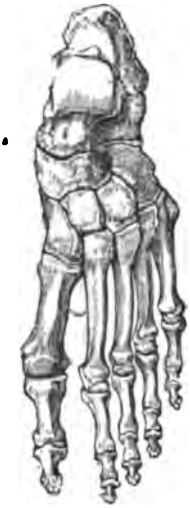
Amputation of the great toe at its junction with the cuneiform bone.

Fig. 794.



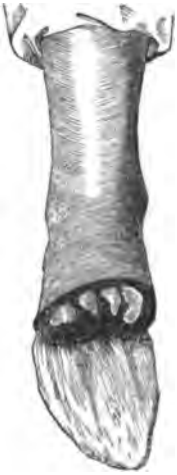
Hey's amputation.

Fig. 795.



Articulations of the foot.

Fig. 796.

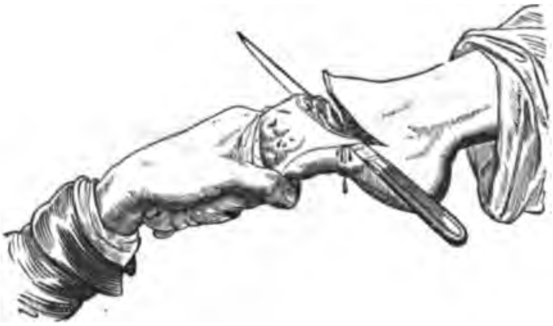


Stump after the removal of the parts, in Hey's operation.

being secured, the flaps are carefully adjusted, and the limb is supported, in an easy and relaxed position, upon its outer surface, to counteract the action of the gastrocnemial muscles, which might otherwise draw the foot out of place.

In caries, as well as in injury of the metatarsal, cuneiform, cuboid, and scaphoid bones, the foot may occasionally be removed in such a manner as to leave merely the astragalus and calcaneum, the principal flap being obtained from the sole. The operation is usually known as *Chopart's amputation*, but the name of Mr. Syme is also generally associated with it, as he was the means of reviving it by recalling to it the attention of the profession in Great Britain and this country. Of the utility of this procedure in the class of cases under consideration, there can no longer be any doubt; I have not only employed it several times myself, but have seen it repeatedly executed by others, and in almost every instance that has come within my notice, the result has been most satisfactory. The stump, although short, is extremely useful, affording an admirable support for the limb, the person generally walking well without the assistance of a cane. In one of my cases, the individual, a young countryman, was able, in less than six months after the operation, to plough and do all the usual work of a farm hand with the greatest facility and comfort.

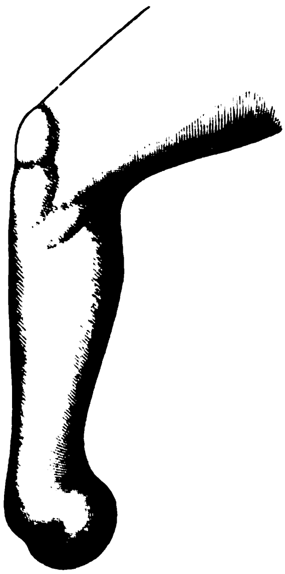
Fig. 797.



Chopart's amputation.

In performing the operation a short flap is made in front of the foot, by an incision extending round its dorsal surface, from one side of the member to the other, in a curvilinear direction, the convexity looking forwards, as in fig. 797. It should begin precisely midway between the outer malleolus and the head of the fifth metatarsal bone, which indicates the site of the calcaneo-cuboid articulation, and terminate on the inner margin of the foot, directly opposite, at the astragalo-navicular articulation. The integument being dissected up, the blade of the knife, which should be sharp-pointed, and at least six inches in length by half an inch in width, is thrust into the two joints just mentioned, and, being brought out below, is next carried forwards, in close contact with the bones, as far as the ball of the toes, in order to form the inferior and main flap. The only arteries which usually require to be tied are the dorsal and two plantar. The extremity of the plantar flap should be well rounded off before it is stitched to the dorsal, and during the cure special care should be taken to keep the gastrocnemial and other flexor muscles completely relaxed, by placing the leg upon its outer surface over a pillow. From neglect of this precaution the stump is liable to be retracted, so that the cicatrice, by constantly coming in contact with the ground, is apt to ulcerate and cause severe suffering. Should such a contingency arise, the proper remedy will be the subcutaneous division of the tendo Achillis; an operation which need never be performed in anticipation of this occurrence, since it may always be effectually avoided if the requisite care be taken during the after-treatment. The adjoining drawing, fig. 798, taken from life, exhibits the ordinary appearances of the stump.

Fig. 798.



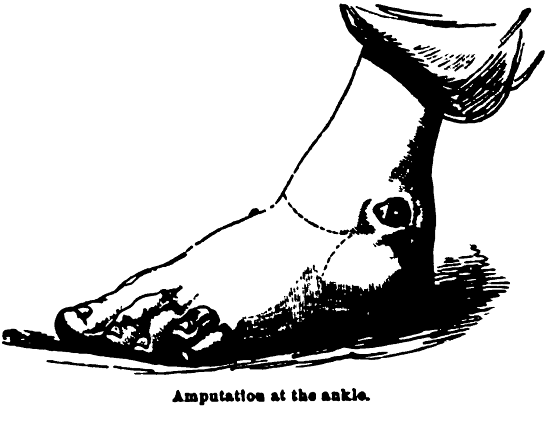
Stump after Chopart's amputation.

AMPUTATION AT THE ANKLE.

Although amputation at the ankle-joint has long been known to the profession, yet the credit of popularizing it is justly due to the teachings and influence of Professor Syme, who performed it for the first time in 1842. Since then he has repeated it upwards of thirty times, and his example has now been so frequently followed by others, in America as well as in Europe, that it may be regarded as one of the established operations in surgery. Less dangerous than amputation of the leg in its continuity, it is particularly adapted to those cases in which there is caries of the posterior tarsal bones, especially the astragalus and calcaneum, without any involvement of the ends of the tibia and fibula. When such involvement exists, except in a very slight degree, the limb should be taken off higher up, otherwise it will be difficult, if not impossible, to prevent a recurrence of the disease.

Syme's amputation—for so this operation is now generally distinguished—is performed with two flaps, one of which is taken from the front and the other from the sole of the foot, the two meeting at the outer and inner ankle. The best instrument is a large scalpel; the foot is placed at a right angle with

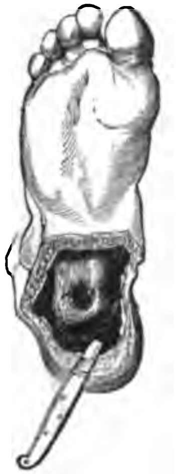
Fig. 799.



Amputation at the ankle.

the leg, and the circulation is controlled by means of the tourniquet applied to the popliteal artery. The operation is commenced by making an incision perpendicular or nearly perpendicular from the centre of one malleolus to that of the other directly across the sole of the foot, and then carrying another, of a curvilinear shape, with the convexity looking forward, over the fore part of the limb, so as to join the two points of the former at an angle of 45°. The lines of these cuts are well seen in fig. 799. The anterior flap is now carefully raised, the astragalus disarticulated, and the posterior flap dissected off from the calcaneum, by passing the knife closely over its surfaces, as in fig. 800, in order to avoid wounding the tibial artery. The tendo Achillis being severed from its connections, the operation is finished by sawing away the two malleoli and a thin slice of the tibia, just enough to include its cartilaginous incrustation. The posterior flap thus formed, consisting of the thick and hardened cushion of the heel, offers an admirable covering for the exposed bones, to which it usually unites by the first intention, and which afterwards enables them to bear pressure with great facility. The only objection to it is that, unless special care is taken in its adjustment, it may form a sac for the accumulation of matter, thus greatly retarding the cure. This, however, is generally easily prevented by the proper application of the bandage in dressing the stump at and for some time after the operation. Should this contingency, however, arise, relief must be afforded by a small puncture through the plantar surface of the flap. The appearance of the stump, after the parts are healed, is shown in fig. 801.

Fig. 800.

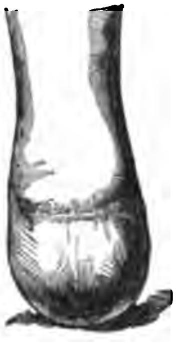


Mode of removing the calcaneum in Syme's amputation.

In performing this operation there are three points which deserve special attention. The first is not to have a redundancy of flap, which will seldom happen if they are both shaped in the manner here described; the second is not to cut any holes into the posterior flap while severing its connections with the calcaneum; and the last is not to divide the posterior tibial artery prior to its separation into its plantar branches, otherwise sloughing of the soft parts might ensue from deficient nourishment. If these precautions be observed, it will be difficult to make a bad stump. When the cure is completed the limb will be from an inch to an inch and a half shorter than natural.

When, in consequence of disease, the flaps cannot be formed according to the plan now laid down, they may be taken from the sides of the limb, including as much of the integument of the heel as possible. The operation is easy enough of execution, but the cicatrice after the healing of the stump will be much in the way of the patient's comfort, and may lead to the necessity of amputating the limb higher up.

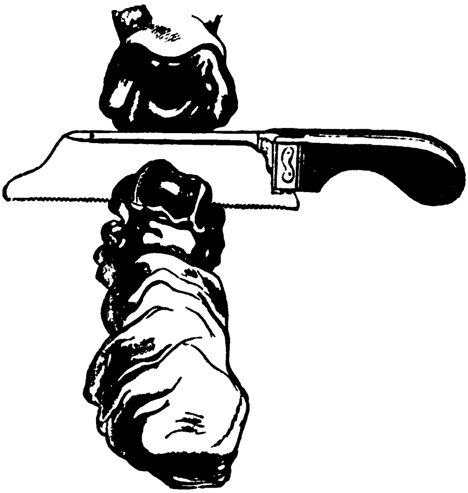
Fig. 801.



Stump after Syme's operation.

The operation of Mr. Syme was modified in 1852 by Mr. Pirogoff, of Russia, by retaining a portion of the calcaneum, and thus imparting greater length and rotundity to the stump. It is performed as in the ordinary disarticulation of the ankle, by making a curvilinear incision round the foot in front, and a perpendicular one under the sole, extending from the fore part of one malleolus to that of the other. The anterior flap being dissected up, the knife, a short, stout bistoury or scalpel, is introduced into the joint, so as to divide the different ligaments, and detach the astragalus. The saw is now applied just behind the astragalus, and moved obliquely downwards and forwards, in order to separate the anterior portion of the calcaneum, as seen in fig. 802. The operation is completed by removing the two malleolar projections, along with a thin layer of the articulating extremity of the tibia, tying the vessels, and stitching the flaps accurately together.

Fig. 802.



Mode of sawing the calcaneum in Pirogoff's operation.

The advantages of this procedure are that it affords not only a longer stump, but one that is better adapted to bear pressure, that there is no danger of wounding the posterior tibial artery, and that the posterior flap is not so liable to form a pouch for the lodgment of pus. Its disadvantages are the tardiness of the cure, and the fact that the disease necessitating a resort to the knife may recur in the retained portion of the bone. The latter objection does not, of course, apply with equal force when the operation is performed on account of injury. When the dressing is completed, the upper surface of the calcaneum is in immediate contact with the lower surface of the tibia and fibula, to which it gradually unites by osseous matter.

In operating upon the cadaver, I have ascertained that an excellent stump may be made by bringing the wedge-shaped portion of the heel-bone up between the malleolar processes of the tibia and fibula, their cartilaginous surfaces being previously well abraded. It is worthy of consideration whether the parts, if they were thus treated upon the living subject, would not afford a better support for useful progression.

Several modifications of this operation have been proposed; as that of Bostecou, of making the plantar flap from within outwards by carrying the incision from the posterior border of one malleolus to the other; of Pirrie, of sawing the calcaneum from below upwards instead of from above downwards; and that of cutting off the projecting ends of the tibia and fibula before disarticulating. I am not aware, however, that any material advantage is gained by any of these procedures.

The *statistics* of Pirogoff's amputation are altogether favorable, the mortality having thus far been very trivial. When the cure is completed, the patient is generally able to walk without the aid of a cane, the limb being not more than about half an inch shorter than in the natural state.

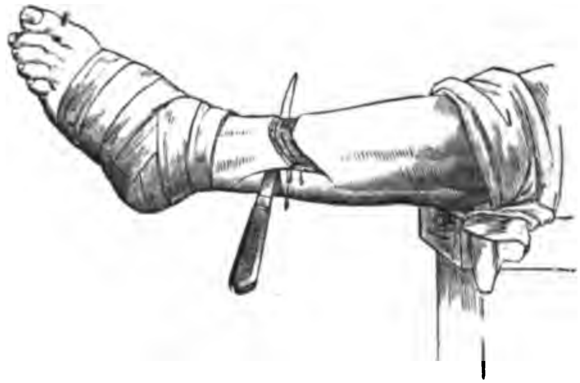
A very long, useful, and seemly stump may sometimes be formed by removing the foot with all the tarsal bones, excepting the astragalus, although such a procedure cannot be often required, inasmuch as this piece is usually diseased along with its fellows. The operation, denominated the *subastragular amputation*, is performed upon the same principles as that of Syme. After the soft parts have been dissected up, the scaphoid and calcaneum are detached from their connections with the astragalus, the bistoury being passed between their contiguous surfaces. Proper care is, of course, taken that the plantar arteries are cut long, to prevent sloughing of the heel flap.

My opinion of the usefulness of the stump left by these different operations at and near the ankle-joint is not, from what I have seen of it, very favorable. It may answer very well when the patient is wealthy; but if he is poor, and obliged to work for his daily subsistence, he will, as a general rule, get along much better with an artificial limb than with a stump that affords him even under the most propitious circumstances, only a very miserable basis of support, and is, besides, constantly liable, from the slightest causes, to pain, irritation, and ulceration.

AMPUTATION OF THE LEG.

The leg should always, if possible, be amputated at its inferior third, that is, about three inches or three inches and a half from the ankle; for here, as elsewhere, the rule is to afford the patient a long stump for the more ready adaptation of an artificial limb. Moreover, statistics serve to show that the mortality after the operation when performed here is remarkably small, the danger increasing as we approach the knee. Of 106 amputations of the leg in this situation, reported by the Parisian surgeons, only 13 proved fatal. The state of the parts, however, concerned in the injury or disease requiring the operation does not often leave us room for choice, and hence we are generally obliged to cut off the extremity much higher up than would otherwise be desirable. The mode of performing the amputation must necessarily vary according to the portion of the leg which is the subject of it.

Fig. 803.

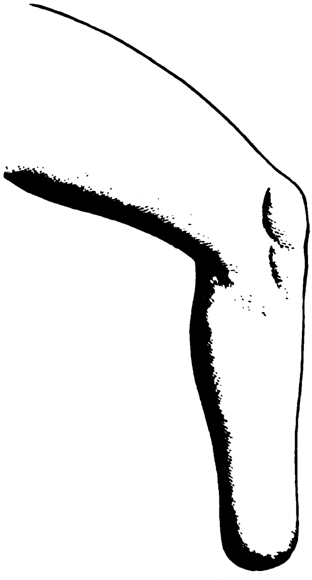


Amputation of the leg at its inferior third.

When the operation is performed in the inferior third of the leg, two flaps are formed from the sides of the limb, by cutting from without inwards; or, instead of this, one may be made in front, and the other behind, as depicted in fig. 803. Composed entirely of integument in front, they receive a considerable quantity of muscular substance behind, and should each be from two inches to two inches and a half in length. The interosseous tissues are divided on a level with the retracted flaps, and the two bones are sawn in such a manner as to sever the fibula before the tibia. Three principal arteries usually require the ligature. The edges of the wound are approximated vertically, to facilitate drainage. Fig. 804 exhibits the shape of the stump as obtained from a sketch from life.

The circular operation makes an excellent stump when the leg requires removal in the lower third of its length; I have practised it in a number of instances, and in every case, save one, with the most gratifying results, the persons being able to walk with great facility, with the aid of an artificial limb. In the exceptional case, the wound gaped, and the bones became necrosed some days after the operation, owing, apparently, to

Fig. 804.

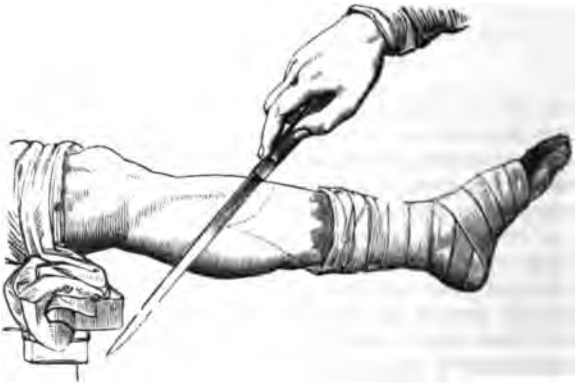


Stump after amputation of the lower part of the leg.

some defect of the constitution, which ultimately caused the death of the patient.

Amputation of the leg at its superior extremity should never be performed above the tubercle of the fibula, or above the attachments of the hamstring muscles, which are so necessary to control the movements of the stump. In general the stump should be at least three inches in length, otherwise it will hardly be able to subserve any useful purpose, and it would be better, in such a case, to remove the limb at the knee. Two flaps are formed in this operation; one, which is entirely cutaneous, in front, by cutting from without inwards, and the other behind, at the expense of the muscles of the calf, by cutting from within outwards, as seen in fig. 805. The latter should not be less than four inches in length, and, in very robust subjects, may even require to be longer. The anterior flap is formed by making a semilunar incision across the front of the limb, from the inner edge of the tibia to the outer edge of the fibula; it is detached by a few strokes of the knife, and held up by an assistant. The instrument is then inserted at the external angle of the preceding cut, and brought out at the corresponding point of the opposite side, care being taken, in performing this part of the operation, not to thrust the extremity of the knife between the two bones; an occurrence which always betrays haste and embarrassment, if not actual want of anatomical knowledge. Transfixion being effected, the knife is drawn rapidly downwards, in close contact with the posterior surface of the bones, for the distance of several inches, when it is made to cut its way out, in order to give the flap a proper degree of convexity. As soon as this has been accomplished, the flap is retracted by the assistant, the interosseous structures are divided at the requisite height, and the two bones are sawn in such a manner as to sever the fibula before the tibia. The principal arteries will next claim attention, and it will generally be found that three—the anterior and posterior tibial, and interosseous—will require to be tied. When the amputation is performed uncommonly high up, the popliteal may be the only vessel demanding ligation, especially if it extends unusually low down before it separates into its terminal branches. The interosseous artery is sometimes found with difficulty, owing to the fact that the tissues in which it is embraced are cut beyond the level of the flaps.

Fig. 805.



Amputation of the leg above its middle.

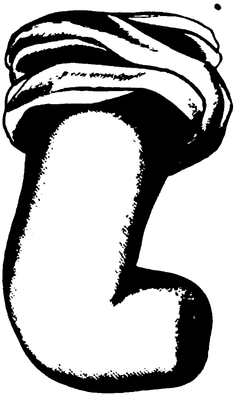
The principal arteries having been secured, the next step of the operation is to retrench the posterior flap by shaving off its redundant muscular substance, so as to adapt it more smoothly and accurately to the exposed bones. I consider this procedure as one of paramount importance to the obtainment of a good stump, and it is one which I adopted many years ago before I was aware that it had been practised by any one else. I rarely allow the flap to be more than half an inch in thickness. Any considerable nervous trunk that may exist in the flap is now divided on a level with the bones, and the operation is completed by sawing off the anterior edge of the tibia, lest, if permitted to remain, it should interfere with the healing of the wound, or, in time, cause so much pressure as to induce ulceration in the cicatrice.

During the after-treatment the limb should be constantly maintained in the extended position, by means of a well-padded posterior splint, otherwise the stump will be permanently retracted by the action of the hamstring and gastrocnemial muscles, so as to interfere materially with the use of an artificial substitute. Should such a contingency occur, despite the best directed efforts of the surgeon, relief must be sought in tenotomy and passive motion, aided, if need be, by suitable apparatus to reclaim the functions of the knee-joint.

The appearances of the stump, made after the above fashion, are represented in fig. 806, from one of my patients.

Amputation at the middle of the leg is performed in the same manner as at the superior extremity, and does not, therefore, require any special notice. It is proper, however, to add that a very good stump may be formed by taking the flaps from the sides, as in the lower operation, although I have always preferred the other method.

Fig. 806.



Stump after amputation of the upper part of the limb.

AMPUTATION AT THE KNEE.

Amputation at the knee-joint was performed by Fabricius Hildanus in 1581. In modern times it is said to have been first executed by Hoin, and, although his example was soon after followed by several of his contemporaries, yet the operation gradually fell into neglect, chiefly, as it would appear, because of the timidity of surgeons to meddle with the large articulations. An attempt to revive the procedure, accompanied by a report of a number of successful cases, was made by Velpeau in 1830, but with so little effect that the subject was again forgotten, and the operation proscribed from our systematic treatises, until a few years ago. Since then much has been urged in commendation of it, and, judging from the success which has attended it, both in this country and in Europe, it is extremely probable that it will soon come into general use.

The reasons which may be alleged in favor of this operation are, first, that the stump being longer than in amputation of the thigh, in its continuity, is more under the control of the patient, and, consequently, better able to bear the weight of the body upon an artificial limb, thus permitting progression without the aid of crutches; secondly, that, as there is no retraction of the muscles, there is less risk of exposure and exfoliation of the bone; thirdly, that the liability to pyemia is generally diminished from the fact that there is no injury inflicted upon the medullary canal; fourthly, that the wound is less than in the removal of the limb in its continuity; and, finally, that the statistics of the operation, as furnished by Markoe, Stephen Smith, and others, display a smaller degree of mortality than amputation of the thigh. It need hardly be stated that disarticulation of the knee should never, as a matter of choice, be performed in preference to amputation of the leg in its continuity; such a procedure, involving more risk to life than the other, would not be justifiable; for, as remarked elsewhere, the nearer the knife approaches the lower part of the trunk the greater is the mortality from its effects.

There are two principal methods of performing this amputation, the relative merits of which have not yet been fairly determined by statistical facts. The one consists in making a long flap in front, the other in making it behind, at the expense chiefly of the gastrocnemial muscle. Both operations are sufficiently easy, but when the surgeon has his choice he will, I think, be able to effect a more rapid cure, as well as make a better stump, by adopting the former procedure.

In the anterior operation, as it may be called, the knife is carried across the forepart of the leg, at least two inches and a half below the head of the tibia, in a semilunar direction, from the anterior margin of one hamstring muscle to that of the other; the flap is then carefully raised, the ligament of the patella divided, the disarticulation effected from before backwards, and the posterior short flap formed from the superior extremity of the gastrocnemial muscle, care being taken to preserve as much of the skin as possible. The patella being retained in this operation serves to fill up the gap between the two condyles, and thus add to the rotundity of the stump. Another advantage is that the line of the wound, after the approximation of the flaps, is brought into a more dependent position, thus admitting of the more ready exit of the discharges.

In the posterior process, the principal covering of the bone is obtained from the muscles of the calf of the leg. The operation is commenced by drawing the knife across the centre of the patella, from one side to the other, the articulation being fully opened at the first incision. The integument is then dissected off from the patella, as high up as the superior extremity of this bone, which is next liberated from its tendon, and left adherent to the tibia. Introducing now the knife into the joint, the connecting structures are rapidly severed, and the main flap formed by carrying the instrument downwards, to a suitable distance, behind the bones. The operation is completed by removing the condyles of the femur, the saw being held in such a manner as to separate a larger portion of the inner than of the outer of these prominences, so as to give the stump a perfectly horizontal direction. Or, what is preferable, because less likely to be followed by suppuration and other mischief, while the stump is equally good after the cure, the condyles are left intact, the flaps being brought in direct contact with their articulating surfaces.

After each of these operations the popliteal artery will, of course, require to be tied, and, in general, also several of its branches. In that by the posterior method, the ends of the ligatures, which are usually placed close together, ought to be brought out through a small aperture in the centre of the long flap; a circumstance which will greatly expedite the adhesive process. The flaps should be stitched with the utmost nicety, and be well supported by plaster and bandage. The great fault apt to be committed in both these operations is that there is usually too little integument left for covering the bone, the consequence of which is that the wound is long in healing, and that the stump can never be well adapted to an artificial limb.

The most valuable *statistics* of this operation are those furnished by Dr. Thomas M. Markoe, in an article upon amputation of the knee-joint in the New York Journal of Medicine and Surgery, for January, 1856. Of 46 cases therein given, 29 were successful and 17 fatal, thus showing a mortality of 37 per cent. Of these cases, 18 occurred in the practice of this country, chiefly in that of the New York surgeons, with only 5 deaths. The first amputation of this kind, in America, was performed in 1824, by the late Professor Nathan Smith, of New Haven, the patient recovering without an untoward symptom.

If we compare the results of these operations with those of amputation of the thigh, it will be found, contrary to what might have been anticipated, and what, at first sight, very few would believe, that they are in favor of the former by 7 per cent. Thus, in the 46 cases of amputation at the knee there were 17 deaths, or a percentage of 37, while in 1055 cases of amputation of the thigh, performed by European and American surgeons, there were 464 deaths, or a percentage of 44.

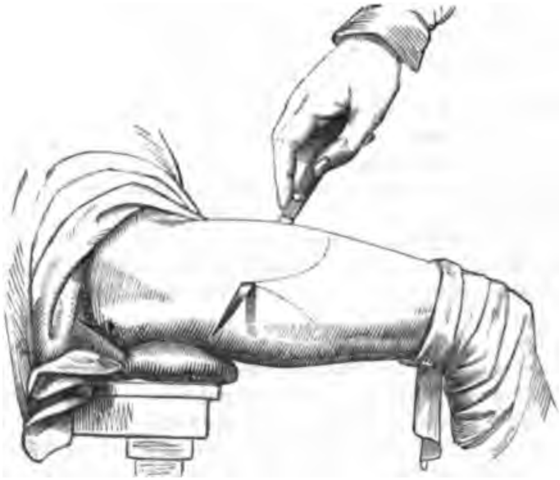
AMPUTATION OF THE THIGH.

The thigh may be removed in any portion of its length; at its inferior third, at its middle, at its superior third, or at the hip-joint, according to the particular exigencies demanding the operation. The great general rule, mentioned elsewhere, of leaving as long a lever, in all cases, as possible, is still more applicable here than in the leg and arm; experience having shown that it is extremely difficult to adapt a short stump of the thigh to an artificial limb, especially when, as not unfrequently happens, it is at the same time very bulky. The operation which I have always performed, and which, in my judgment, is decidedly the best, is that by flaps, taken from the anterior and posterior parts of the thigh, I have seen enough of the circular method to satisfy me that it is, as a general rule, even when well executed, seriously objectionable, on the ground that it seldom affords an adequate covering for the stump. Hence it is so often followed by exfoliation of the bone, tedious suppuration, and ulceration of the integuments. From all these mishaps the flap amputation is almost entirely exempt. I will not deny that I have occasionally witnessed admirable results from the circular operation, but that it is more liable to be followed by accidents and by future inconvenience and suffering is unquestionable, and it is for these reasons, and not because it involves any particular difficulty or skill in its execution, that it should give place to the flap method.

Although the operation by the antero-posterior flap usually furnishes the best result, from the circumstance that there is less liability to retraction, yet a very excellent stump may be made by taking the covering from the sides of the limb, or even by dividing the parts obliquely. The fact is, the surgeon has often no choice in the matter, such being the nature of the disease or injury demanding the operation. In a case of horrible deformity and ulceration of the leg, from the effects of a burn, followed by permanent anchylosis of the knee-joint, under my observation, many years ago, in a boy five years of age, I was obliged to depend entirely upon one flap taken from the posterior surface of the thigh, and the result could not possibly have been more satisfactory. Whenever circumstances require a departure from the ordinary rules of procedure, the educated surgeon will have no difficulty in adapting his skill to the exigencies of the case.

The lowest point at which amputation of the thigh can conveniently be performed is about four inches above the centre of the knee. The anterior flap should always be made first, as the posterior includes the femoral artery. The soft parts being forcibly raised with the thumb and fingers, applied to the opposite side of the limb, the knife is entered about three inches above the superior extremity of the patella, and, transfixion being completed, is drawn downwards close along the anterior surface of the femur, cutting its way out at the point

Fig. 807.

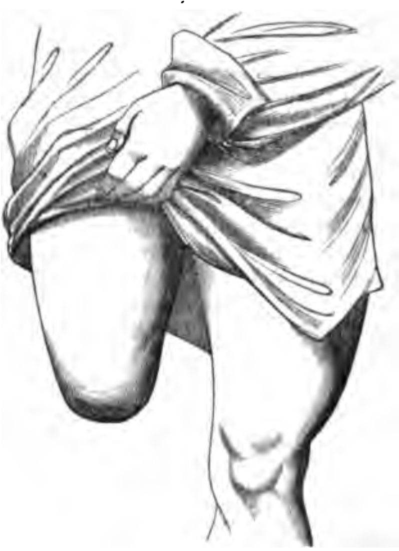


Amputation of the thigh.

just mentioned. The flap being now carefully retracted, the instrument is reintroduced into the wound at its upper edge, behind the bone, so as to fashion the posterior flap, which should be somewhat longer than the anterior, otherwise there will be danger of insufficiency of covering. This flap is now also held back, when, the knife being passed rapidly round the bone, on a level with the retracted structures, so as to divide any muscular fibres that may have escaped it in the previous stages of the operation, the bone is sawn off in the usual manner. The femoral artery with several of its branches will require ligation, and the principal nervous trunks should be retrenched before approximating the flaps.

The stump left by the flap operation, as here described, is a very pretty one, and could not possibly be more serviceable. The drawing, fig. 808, is from life.

Fig. 808.



Stump after amputation of the thigh.

The operation now described may occasionally be advantageously executed, according to Vermale's method, by lateral flaps, of which the outer one should always be formed first. The transfixion is effected at the same height of the limb as in the preceding case, that is, about four inches above the upper extremity of the patella, the knife being inserted at the centre of the thigh in front, and pushed out at a corresponding point in the ham, whence it is carried downwards and outwards nearly as far as the external condyle. The inner flap is formed in the same manner, except that the instrument is kept in closer contact with the bone, lest the femoral artery be split. In other respects, the operation is to be conducted in the same manner as in the antero-posterior flap procedure.

In the middle and upper third of the thigh, the method by anterior and posterior flaps deserves a decided preference over that by lateral flaps. The great advantages which it possesses over the latter are that the muscles are more evenly divided, and that, consequently, there is greater probability of obtaining a smooth and useful stump for sustaining the weight of the body upon an artifical limb. The different steps of the operation are similar to those which characterize amputation in the lower third of the thigh, and hence there is no necessity whatever for any formal description of it, as they will be readily comprehended by what precedes.

Amputation of the thigh by the rectangular method of Mr. Teale is described at p. 506 of the first volume, and does not, therefore, require any special notice here.

No *statistics*, on an extended scale, of amputation of the thigh in its continuity, after gunshot injuries, have yet been published. The operation was performed, according to Mr. Macleod, by the English surgeons in the Crimea, in the upper third of the thigh 39 times, with a fatal result in 34. All the cases, excepting one, were primary, and that one perished. Amputation of the middle third of the limb was performed in 65 cases, of which 38 died. Of these cases, 56 were primary, with 31 deaths, or a mortality of 55.3 per cent.; 9 cases were operated upon at a later period, and of these 7, or 77.7 per cent., died. Removal of the limb in its lower third was effected in 60 cases, of which 46 were primary, with a mortality of 50 per cent., and 14 secondary, with a mortality of 71.4 per cent. The result of the experience of the surgeons in the Schleswig-Holstein campaigns, in these amputations, was equally unfavorable. In the Italian hospitals, according to Dr. Hermann Demme, the mortality of amputations of all kinds in the upper third of the thigh, was 87 per cent.; in the middle third, 72 per cent.; and in the lower third, 61½ per cent. The result of conservative treatment in gunshot fractures of the thigh, in the Franco-Sardinian army, as given by the same authority, was 42 per cent. for the superior third of the thigh, 39 per cent. for the middle third, and 56½ per cent. for the inferior third.

Much of this frightful mortality is, doubtless, justly attributable to the excessive shock sustained by the crushing effects of the injury necessitating the amputation, to the violence inflicted upon the patients during their transportation from the field of battle, and to the influence of the vitiated air of military hospitals; all tending to produce a state of exhaustion incompatible with repair, and promotive of the occurrence of erysipelas, osteophlebitis, pyemia, and typhoid fever.

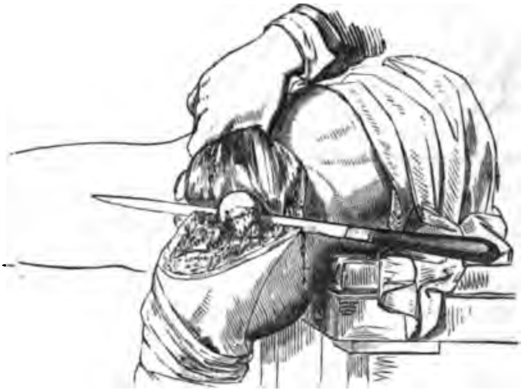
AMPUTATION AT THE HIP.

Amputation of the hip-joint may become necessary both on account of disease and accident; but the operation is so formidable a one, and so fraught with danger, that it should never be performed unless the patient has no other chance of escape. The great risk which attends it is due to the loss of blood, suppuration, erysipelas, and pyemia. The hemorrhage, however, will not, in any case, be likely to be profuse, if proper care be taken to compress the arteries during the formation of the flaps, and if the operation be performed, as it always should be, in twenty-five or thirty seconds, good and trustworthy assistants being at hand to anticipate the surgeon's wishes and facilitate his movements. Under highly favorable circumstances, much of the enormous wound may unite by the first intention; but, in general, more or less suppuration takes place, and in some instances the discharge is so copious as to lead to fatal exhaustion. The greatest danger of all, however, is the occurrence of pyemia, or secondary abscess, especially in amputation at the hip-joint in consequence of injury, as a compound fracture, or a gunshot wound. The shock of the operation must formerly have been very violent, and often of itself sufficient to cause death within a short time after its performance; now, however, that we can avail ourselves of the use of anæsthetic agents, no special risk is to be apprehended from that source.

This operation, for a long time regarded as impracticable, and until lately alternately praised and censured, was first practised by Lacroix, in the case of a child, fourteen years of age, laboring under gangrene from the use of ergot. It may be performed in a great variety of ways, with two of which the surgeon should be familiar, as the circumstances of the case may leave him no opportunity for choice. These are the lateral and the antero-posterior flap methods, of which the first, as a general rule, deserves a decided preference, from the fact that it admits of more ready drainage during the healing of the stump.

In the lateral amputation, the external incisions should always be made first, though this is not so important when there are skilful assistants, of whom there should be at least four; one for administering chloroform, two for retracting the flaps and compressing the arteries, and one for holding the limb. If these matters be properly attended to, the operation is a comparatively easy one, and may often be executed in an almost incredibly short time, and with the loss of hardly a few ounces of blood. The buttock being brought well over the edge of the table, the thigh pretty widely separated and everted, and the femoral artery compressed over the brim of the pelvis, the knife, which should be upwards of a foot in length, is entered, supposing the operation is performed on the left limb, immediately below the tuberosity of the ischium, and made to issue at a point midway between the anterior superior spinous process of the ilium and the great trochanter. The external flap is now formed by cutting downwards and outwards, in close contact with the bone, for at least four inches, especially if the subject be at all muscular. An assistant is ready to seize and retract the flap the moment it is fashioned, as well as to compress the orifices of the bleeding vessels. Reinserting the knife into the upper angle of the wound, it is rapidly pushed down, along the inner surface of the bone, so as to form a large flap in that direction, to compensate for the small one on the outside. The assistant having charge of the femoral artery in the groin now grasps the divided vessel, at the same time lifting up the flap. The next step of the operation is the disarticulation, which is readily effected by opening the upper and inner part of the joint, and then swiftly carrying the knife round the head of the bone, previously rendered prominent by depressing the knee. The arteries are now secured, first the femoral, and successively any other that may require the ligature, the assistants maintaining the compression until each vessel is ready to be tied.

Fig. 809.



Amputation at the hip-joint.

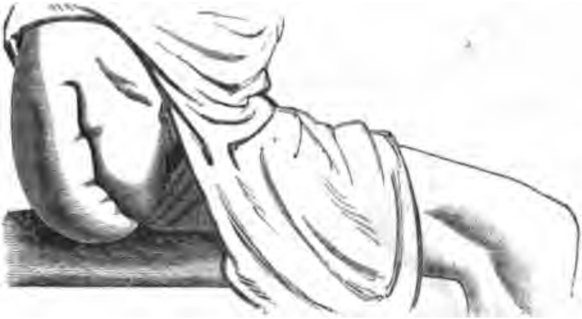
The antero-posterior amputation at the hip-joint, delineated in fig. 809, is conducted upon the same general principles as the lateral, the only difference being the manner in which the flaps are made. Great care must also be taken to hold the scrotum out of the way. It will be most convenient to make the anterior flap first; this, when the operation is performed on the left side, is done by entering the knife on the outside of the hip, midway between the anterior superior spinous process of the ilium and the great trochanter, carrying it across the neck of the femur, and pushing it out at the centre of the thigh, immediately below the pelvis. The flap, which should be about four inches in length, is then formed in the usual manner; the joint is opened at its upper and inner part, as in the preceding case; and, the disarticulation being effected, the posterior flap is fashioned by cutting along the back part of the bone.

Great stress is very properly laid by all surgeons upon the prevention of hemorrhage in this amputation. With this view not a few recommend, as a preliminary step, the ligation of the femoral artery, while the majority believe that compression of that vessel, as it passes over the pubic bone, will, in general, be quite sufficient. In a case of amputation at the hip-joint, by Professor Pancoast, at the Pennsylvania Hospital, in June, 1860, this object was very effectually attained by compression of the abdominal aorta by means of a tourniquet, encircling the body at the umbilicus. The patient, a man, aged thirty-eight years, bore the operation well under ether, breathing with perfect ease, and losing hardly any blood, the application of the instrument being rendered the more satisfactory in consequence of the previous evacuation of the bowels. He survived the operation, performed on account of a large encephaloid tumor of the upper part of the thigh, two years, when he died from a return of the disease.

In the case of a girl, nine years of age, whose thigh I removed at the hip-joint in January, 1862, at the Philadelphia Hospital, on account of injuries sustained by a burn fifteen months previously, the circulation of the limb was effectually controlled by the pressure of the thumbs upon the abdominal aorta and femoral artery. The operation, in which I was kindly aided by my colleagues, Drs. Agnew, Levis, and Kenderdine, was performed in less than twenty seconds, with a loss hardly of an ounce and a half of blood. The patient, although exceedingly anemic and exhausted at the time, recovered without an untoward symptom.

The appearances of the stump and the line of the cicatrice, in the antero-posterior operation, are well displayed in the annexed sketch, fig. 810, from a daguerreotype kindly sent to me by Professor J. F. May, of Washington. His patient, a man forty years of age, had been laboring under caries of the head, neck and shaft of the thigh-bone, attended with great enlargement of the limb. The operation was performed within thirty seconds, with a loss of blood hardly amounting to eight ounces. A rapid and complete recovery followed. The drawing here represented was taken nearly two years and a half after the operation.

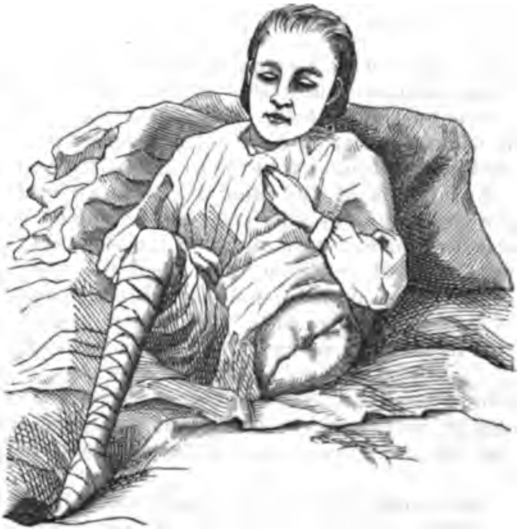
Fig. 810.



Stump after amputation at the hip-joint.

The stump in the case of Margaret Thompson, referred to above, is exhibited at fig. 811. The drawing was taken upwards of a year after the operation. The flaps, made with a narrow catlin, were anterior and posterior.

Fig. 811.



Amputation at the hip-joint.

After both of these operations, the flaps, during the first four or five hours, should be supported simply by a few adhesive strips, and kept constantly wet with cold water. At the end of this time, when all oozing will probably have ceased, they should be approximated by numerous points of the interrupted suture, plaster, and bandage, care being taken to interpose a small tent at the inferior angle of the wound, for the purposes of drainage, which must always necessarily be considerable after such an extensive mutilation. When the patient is very robust, I should regard it as good practice to remove a large portion of the muscular mass composing the internal flap, under the conviction that the procedure, by insuring the more rapid healing of the huge wound, would greatly diminish the risk of pyemia and other accidents.

From the various *statistics* of amputations at the hip-joint, it may be inferred that the results are, as a general rule, much more favorable when the operation is done for the removal of disease than for the relief of accident; depending, probably, upon the fact that, in the former case, the system is more inured to suffering, and, consequently, more tolerant of the effects of the operation, while, in the other, the change is too sudden and severe to enable it to bear up under its exhausting influence.

Mr. Erichsen, availing himself of the labors of Dr. Stephen Smith, and also of those of other writers, has given the results of 126 cases of this operation, of which 76 proved fatal. Of 47 cases in which it was performed for injuries, 35 died. According to Mr. Macleod, of the ten cases that occurred in the Crimea, not one recovered. A successful instance of amputation of the hip-joint was reported, not long ago, by Dr. J. M. Warren, as the first of the kind that had ever taken place at Boston. It was performed on account of osteo-sarcoma of the femur, in a lad sixteen years of age.

Mons. Lagouest, who served with the French army in the Crimea, has collected all the cases in which this operation has been performed on account of gunshot injury. In 30 of these the operation was immediate, and all perished; in 11 it was mediate, 8 dying, and 3 recovering; and in 3 it was ulterior, 2 proving fatal, and 1 unsuccessful. "Of the first category, some died during the operation itself, others soon after they had been carried to their beds, and all within ten days, except two patients mentioned by Larrey, one of whom lived twenty-one and the other thirty days." Only one case, so far as I have been able to ascertain, of successful amputation at the hip-joint on account of gunshot injury has occurred in the Federal army during the present war. The operator was Dr. Shippen, of this city.

All experience seems to show that amputation at this joint, if performed immediately after a severe injury, whether gunshot, compound fracture, or compound dislocation, or wound of any kind, proves almost invariably fatal. Hence the practical conclusion is to postpone the operation always to the latest possible period; certainly, if practicable, until the establishment of suppurative action, and until the system has had time to become inured to its new condition. In compound fractures of the thigh, involving the head or neck of that bone and the integrity of the femoral vessels, the case will, of course, not admit of much delay, and the patient must, therefore, run his chance. If the vessels are intact, resection of the upper part of the femur should take the place of ablation of the limb at the joint. If the soft parts are extensively injured and the bone violently shattered, but its head sound, the most judicious practice is to amputate the limb at or near the trochanters, leaving the extremity of the bone in the acetabulum.

The happy results of consecutive amputation at the hip-joint in gunshot lesions are well exemplified in the practice of Dr. Roux, of Toulon, who performed the operation six times upon soldiers wounded during the war in Italy, with four recoveries and two deaths.

Amputation at the hip-joint has occasionally been performed after previous amputation of the corresponding thigh above the knee. Of 7 cases of this kind, in the hands of Astley Cooper, Textor, Mayo, Cox, Syme, Bradbury, and Van Buren, all were successful. In an instance in the practice of Mr. Guthrie, where the operation was performed on account of gangrene and hemorrhage after amputation of the thigh for a gunshot wound, the result was fatal.

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